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FIRST OF THE SERIES OF PIONEERS OF MODERN ANÆSTHESIA.

DR. DUDLEY BUXTON.

THERE are men who plant and men who reap, and in the Science and Practice of Anæsthesia especially is it true that those who are now able to garner, owe, and willingly pay, grateful tribute to those sturdy, early workers who tilled the virgin, stubborn soil and by sheer courage and persistence forced it to give forth the fruits of victory.

The Pioneers of Modern Anæsthesia blazed the trail for the present-day Anæsthetist, and it is well to glance back at the period when our art was yet young and needed to be placed upon a working basis.

For the subject of Anæsthetics, at the time when Dudley Buxton began his investigations into the pharmacology of these agents, occupied a position of the most minor importance. There were few specialists practicing as anæsthetists who were attached to hospitals; there was no systematic teaching by way of lectures or demonstrations although a little perfunctory instruction was given to the students as they stood by the side of the anæsthetist while he administered the anæsthetic. Little importance was usually attached to the function of the anæsthetist, and his remuneration usually consisted of the odd shillings out of the guineas which constituted the fee of the Surgeon. Frequently a hundred guinea fee went to the surgeon and he handed two guineas to the assistant commonly a house surgeon, who administered the chloroform or ether. There were certain specialists who were justly held in high repute, Joseph Clover, Woodhouse Braine, Hewlett Bailey, and Joseph Mills, but even these with the exception of

Clover did not experiment, write, or give any systematic teaching. Clover delivered a lecture at wide intervals at University College Hospital. Such as it was systematic instruction was relegated to a House officer at the various teaching schools. In the provinces Mr. Pridgin Teale, a surgeon, and Lord Lister—then Sir Joseph Lister—supported their views by writing, and in the case of Lister by experiment.

Scotland was completely controlled by the strenuous example and pronouncements of James Syme, upon whose shoulders had fallen the anæsthetic cloak of Sir James Y. Simpson, and when Lister, having eaten of the strong meat of Syme's teaching came to London, he sought to convert the English profession to a wholehearted faith in chloroform; Clover's methods, however, kept the flag of ether flying. The Report of the Royal Medical Chirurgical Society (now the Royal Society of Medicine) published in 1864, focussed the views of the profession at that date. Chloroform, it asserted, was dangerous when given by some methods, safer when certain rules, which were displayed in the Report, were followed, and Mr. Clover's chloroform apparatus was recommended. Ether was too slow, it was said, and uncertain in its action, and so the Report recommended a compromise, the usual resource of those wto cannot make up their minds. Dr. George Harley proposed the A. C. E. mixture, or as an alternative the C. E. mixture and these were blessed by the writers of the Report. Incidentally, it is interesting to note that all the members of the investigating Committee were surgeons, with Mr.Clover co-opted as an adviser and investigator. The anæsthetist crossed the t's and dotted the i's but the robust letter was surgical with a dash of medicine.

Twenty years later Clover's gas and ether method, the inhaler of Dr. Ormsby, and Mr. Pridgin Teale's advocacy had altered the horizon and ether came into its own, although the actual work done, even by the specialists was haphazard rather than guided by physiological knowledge. Perhaps one of the most useful works of Dr. Buxton was his insistence that all the rule of thumb methods of giving anæsthetics are dangerous and should be replaced by those based upon an accurate knowledge of the pharmacology of the drug employed

and of the physiology or pathological condition of the patient.

We are told that it was not an uncommon thing at this time for surgeons of high repute to perform minor surgical operations in their consulting rooms and to seek for the assistance of the butler to give "a whiff of anaesthetic" which in most cases was chloroform poured on a towel. Nitrous Oxide was given by a footman or mechanic from the work-room. The house surgeon or dresser, sometimes an assistant surgeon or surgical colleague, was usually taken by the surgeon when he was operating in a private house. Nursing homes were hardly known at that time.

On one occasion a distinguished surgeon took Dr. Buxton to a private house where he was to meet the then President of the college of Physicians and examine a patient under an anæsthetic. On entering the bedroom they saw the physician and the patient locked in one another's arms rolling about on the floor. The doctor, not expecting an anæsthetist, had attempted, with more optimism than skill, to chloroform the patient but had deplorably failed in getting him beyond the stage of excitement.

Dr. Buxton's appointment as anæsthetist to the Soho Square Hospital for Women brought him in contact with the anæsthetising for abdominal surgery. The proprietary article called bichloride of methylene, and advocated by Spencer Wells and Benjamin Ward Richardson, was then commonly and lavishly used for such cases. Dr. Buxton found it possessed no intrinsic advantages except to the vendors, and it was in fact merely methyl chloroform mixed with methyl alcohol. He discarded its use, replacing it at first by pure chloroform given by the quasi dosimetric system of the Junker's inhaler, and later by ether. The use of ether in abdominal work however was fiercely opposed by most Surgeons, especially those trained in Scotland. Pulmonary sequelæ, renal complications and severe vomiting with alimentary disturbance were common with ether as then aministered. Dr. Buxton contested this issue, and after years of demonstration in hospital and study of the cases, he was able to prove that such sequelæ were not the necessary result of ether administration but were really due

to either faulty methods or the use of such massive amounts of ether with insufficient dilution so that the patient was not merely narcotised but was poisoned by the ether. Indeed the after-effects brought about were Nature's method of eliminating a poison. He opposed the specious suggestion that cyanosis was essential to ether anæsthesia and was due to the retention of carbon di-oxide, and contested the further belief that this retention of carbon di-oxide was beneficial because it acted as a stimulus to the respiratory centre, while it acted synergetically with the ether as an anæsthetic. He indicated that, deprived of its appropriate supply of oxygen the respiratory centre became rapidly exhausted and in this state, the cutting off of oxygen and increasing carbon di-oxide must still further produce an asphyxial state which would block the pulmonary circulation and ultimately make for bad after-effects and heart failure. His teaching was emphatic that all cyanosis with nitrous oxide gas, ether or chloroform was unnecessary and dangerous. He advocated the use of oxygen when these anæsthetics were employed and he did this at a time when the use of oxygen was little known. For a time these views were opposed by other workers, one well known authority writing that he was not convinced of the value of the employment of oxygen in anæsthesia.

The use of nitrous oxide was, at first, opposed in this country by the profession who averred that it was dangerous. Dr. George Johnson, an authority on asphyxia, supported the view then commonly held by physicians and surgeons that this gas acted as an asphyxiant and possessed only the negative action of shutting out oxygen so producing asphyxial unconsciousness. Dr. Buxton traversed this statement and in his experiments demonstrated that nitrous oxide possessed a physiological action peculiar to itself, that it formed a loose combination with the colouring matter of the blood and was a true anæsthetic when allowed to act upon the brain, indeed produced anæsthesia, whereas asphyxia only led to unconsciousness at a later period and when the animal was *in articulo mortis*. Upon the heart and circulation he demonstrated that its action was dissimilar to that of asphyxia.

With the appointment as anæsthetist in University College Hospital commenced his systematic teaching (undertaken at first in spite of discouraging opposition), and the organisation of the department of anæsthesia. The authorities at that time considered that an anæsthetist should restrict his energies to administering anæsthetics and giving an occasional remark to the two or three students who stood behind his chair and watched him,or more often, the manipulations of the surgeons. However, Dr. Buxton pointed out no skill in anæsthetic methods can be obtained unless the student has responsibility imposed on him, and so he made the students anæsthetise the patient while he supervised their efforts. There was no reliable book on the subject so he gave systematic lectures as well as occasional clinical lectures, these last through the kindness of Mr. Christopher Heath, the Holme Professor of Surgery. The last named lectures dealt with the more recondite aspects of anæsthesia and attracted senior students, the house residents and not a few medical men from outside. The students were divided into small groups and each took charge under the anæsthetist of a patient. Sheets duly ruled and supplied with suitable headings were printed and filled in every day by the anæsthetist's clerk. The student examined the patient before and after the anæsthetic and gave the narcotic except in exceptionally difficult cases when Dr. Buxton would explain his line of procedure. The next step was to induce the examining bodies to make the teaching of anæsthesia a compulsory part of the curriculum and to schedule it as one of the subjects for examination. In this step Dr. Buxton took an active and strenuous part and finally this important reform was consummated.

The Society of Anæsthetists, of which Dr. Buxton was one of the founders, undoubtedly did much to advance the status of the anæsthetist and to encourage research.

By holding meetings and inviting surgeons and physiologists to attend and discuss questions which although not primarily technical to anæsthesia were closely knit to this subject and so brought within their purview matters of wider interest. A closer association between surgeon and anæsthetist was thus obtained and both were instructed.

It marked the hemicentenary of the use of Chloroform as

an anæsthetic by convening a large meeting, not only of its members, but of the profession at large, and at its request Dr. Buxton was asked to deliver an oration,which was entitled "Empiricism or Science: Anæsthesia 1847 - 1897." Dr. Buxton was President of this society during two years.

Chloroform was at this time still largely employed by methods which too often led to fatalities. Dr. Buxton advocated a wider adoption of ether showing that anæsthetic could be employed in most cases if atropine was injected before the inhalation, while if care was taken to prevent chilling in the passages and wards after the operation, chest complications could be eliminated. This view he enforced before the Society of Anæsthetists.

However, the obvious objection to oral inhalation of ether for operations on the oro-nasal passages, mouth and chest, led Dr. Buxton to introduce in 1885, rectal etherisation (Ether and Air.) For this purpose he suggested an apparatus and practiced the method in many cases and with marked success.

With the publication of the 1st Hyderabad Report (1889) on Chloroform drawn up by the late Lieut.-Col. Lawrie .B. I.M.S. the old discussion as to the cause of death under chloroform was revived. Those who followed the teaching of the Scotch School as advanced by Syme, Lord Lister and Lieut.-Col. Lawrie contended that chloroform killed entirely through respiratory failure, hence fatalities were preventable; while those who accepted the views of Snow and Paul Bert concluded that death was due to heart failure, itself the result of chloroform poisoning. The first Hyderabad Commission Report was reviewed in *The Lancet* by Dr. Buxton who pointed out that it was entirely inadequate and that the experiments were too few, were crudely conceived and unscientifically carried out. Dr. Lawrie took strong exception to this criticism . At Lawrie's instance the Nizam of Hyderabad with fine public spirit provided large funds for a second Commission to investigate the subject, de novo, and offered a large fee to Dr Buxton if he would investigate the matter in India. However, he decided to decline to do the experiments in India where he would be under unfavourable conditions as regards apparatus and skilled assistants. He offered to undertake the experiments in London. This was not agreed

to, but he was requested by *The Lancet* to make an exhaustive report from the clinical side of the action of chloroform on human beings. A questionnaire written in the chief European languages was sent by the *Lancet* to the chief surgical centres at home and abroad, and the answers were carefully collated and published with a full Report drawn up by Dr. Buxton. The *Lancet* issued this in 1893, with the experimental work done in India, which had been watched by Sir Lauder Brunton, who went to India as the *Lancet's* representative. However, the experimental portion was a disappointment and wholly inconclusive. The actual surgical work referred to by Dr. Lawrie as proving the safety of chloroform was of so slight a character and was done on natives whose psychology is so different from that of Europeans that the Reports failed to carry conviction. The experimental work was again called in question by Dr. Buxton and others and subsidiary commissions were financed, enabling English physiologists to investigate the points in dispute.

The investigations done in England (Cambridge) under strictly controlled conditions did not support Col. Lawrie's assertions. They seemed to prove that acute chloroform deaths were always due to circulation failure and arose from excessive strength of vapour; dangers from gradual respiratory failure were recoverable.

Dr. Buxton invited Dr. Lawrie to send some of his trained native doctors to give chloroform to patients in University College Hospital. These highly qualified doctors found that their methods wholly failed to produce adequate narcosis for the type of operation usual in this country and Dr. Buxton had the satisfaction of being asked by two of them to be taught the methods pursued in University College Hospital.

During the preparation of this Clinical Report Dr. Buxton was struck by the fact that although it was possible more or less accurately to obtain the statistics of deaths under anæsthetics there was no accurate data obtainable showing how many times any given anæsthetic was given. Thus supposing a return of 6 deaths under chloroform and 12 under ether was received from a particular town during one year, it would be a fallacy to conclude that double the number of patients

died under one anæsthetic, unless an equal number of patients were given chloroform and ether. At this time occurred the Annual General Meeting of the British Medical Association, held at Bournemouth, and Dr. Buxton being asked to open a discussion upon Anæsthesia, took as his subject the importance of collecting statistics of the Clinical evidence concerning the dangers and difficulties arising not only of the abnormal but also statistics of the normal cases of anæsthesia occurring in some definite period—say one year. As a result the Association appointed a Committee to undertake this work and Dr. Buxton as Chairman took a leading part on the small executive Committee. He designed a special note book with headings, spaces, etc., to ensure uniformity in the returns sent in; these note books were sent to all the hospitals and leading surgeons in British centres. Some 28,000 cases were studied and classified and a Report was eventually published.

However, more important work was done by a Committee subsequently formed by the Association called The Special Chloroform Committee*. Dr. Buxton acted as secretary and convenor. Elaborate investigations under rigid control were made concerning the physiological action of Chloroform and a consideration of the methods of administering it were undertaken and these with a Report (drawn up by Dr. Buxton) were published.

The Committee advised the use of a regulating inhaler and fixed the limit of safety at 2%, a figure coinciding with that arrived at by M. Paul Bert. The Vernon Harcourt inhaler, after prolonged testing (undertaken by Dr. Buxton with assistants at University College Hospital and elsewhere) was adopted as the approved inhaler recommended by the Committee.

In 1912 the British Medical Association held the Annual General Meeting in Liverpool and Dr. Buxton occupied the chair of President in the Section devoted to Anæsthetics; and

*The Committee as first appointed (1901) consisted of Dr. (now Sir James) Barr, Dr. Dudley Buxton, (Secretary), the late Mr. Vernon Harcourt, F.R.S., the late Sir Victor Horsley, F.R.S., Professor Sherrington, O.M., F.R.S., and the late D.A.D. Waller, F.R.S., others joined the committee at a later date, among these was Dr. Maclardie.

The Report was published in the British Medical Journal, and in book form in 1912.

in 1913, he was elected President of the Section of Anæsthetics in the XVIIth International Medical Congress and this, the first occasion when Anæsthetics received the honour of being ranked as a Special subject having its own Section, proved a great success. Dr. Buxton was selected to give evidence before the Commission on vivisection in connection with narcotics and subsequently he gave evidence before a Departmental Enquiry held at the Home Office, to consider the desirability of passing a Bill making the use of Anæsthetics by unqualified persons an offence by law.

He undertook researches (1) on the effects of anæsthetics upon the corpuscles in the blood stream (2), on Ethyl Chloride, (3) on the effects of very prolonged inhalations of chloroform upon the lower animals (4) on the Physiological Action of Nitrous Oxide Gas (5) effects of inhalation of certain anæsthetics on the kidneys, this last with Dr. Levy.

Dr. Buxton has published a work on anæsthetics, which has passed through six editions, various articles in Encyclopedias and in the Transactions of various societies and periodicals, and these give evidence of his activities in promoting the advance of the Science and Art of Anæsthesia.

A number of essays from his pen deal with the historical side of the subject, notably one which advances the claims of Dr. Crawford Long to be the first surgeon to employ ether as an anæsthetic.

In dealing with this fascinating period of the developement of our speciality, surely the place of honour must be given to the subject of our article, the Doyen of the Pioneers of Modern Anæsthesia.

PROSTATECTOMY UNDER CAUDAL AND TRANSSACRAL BLOCK.

By Robert Burns Anderson, M.D., Brooklyn, New York.

Read before stated meeting of the American Society of Regional Anæsthesia, April 6th, 1926, at the New York Academy of Medicine.

FROM the autumn of 1922 to January 1st, 1926, 125 consecutive cases of prostatic obstruction have been operated upon under caudal and transsacral block. No prostatectomies have been done under general narcosis, since block anæsthesia was first used by me. It has not been necessary in any of these to supplement the block anæsthesia with a light general narcosis. Only two cases manifested discomfort enough to bear mentioning—and these occurred in the early days of my efforts at block anæsthesia when the value of preoperative morphine was not sufficiently understood by the operator. One hundred of these cases were large adenomatous prostates on whom suprapubic prostatectomy was done. Twenty-five were cases of hard small prostatics with contractures of the vesical neck. On six of these the Alexander perineal operation was done, using Young's punch through the wound to clear the bladder neck. On the remaining 19 cases only the Young's punch was used. In an analysis of these prostatectomies little mention will be made of the 25 cases of prostatic sclerosis. On the average they were in better physical condition, the operative interference was less severe and their time in hospital was of shorter duration. However, the mortality was the same.

Sixty-one of the one hundred adenomatous prostates were brought to the hospital by ambulance; nearly one-half were in very poor physical condition. They were with good preparation under general narcosis desperate surgical risks, marked degeneration of arteries and heart, pulmonary emphysema, chronic myocarditis, poor masculation. They were pale, flabby, helpless old men, who if general narcosis was to be given them, the best that could be expected was a suprapubic

sinus. If they survived this, they were discharged from the hospital for six months or longer, to return for a prostatectomy if living or if the mental status of the patient would submit to operation after having subjected himself to the torture of a dirty, discharging suprapubic sinus for a period of months. Seventy-eight of these one hundred cases were prepared for operation by an indwelling catheter, forced fluids, proper hygiene, and diet and digitalization. Twenty-two cases were prepared by suprapubic sinus. On five of these cases during the early days of my experience suprapubic cystotomy was done following the routine of the preparation of patients for prostatectomy using general narcosis as an anæsthetic. To-day they would have been prepared by an indwelling catheter. The suprapubic sinus was made in the remaining cases for vesical calculi, vesical growths, intolerant urethra, epididymitis or a patient in very bad condition. The average time consumed in the preparation of these patients was 13.2 days, the shortest, one day, the longest, 93 days. Case 40326, 7.5 days, 77 years old, hard arteries, no pulse in one wrist, pulmonary emphysema, myocarditis, blood pressure 120/100; senile, tremor; coagulation time, 10 minutes. Badly infected on admission; the temperature ranged from 102° to 97°F; pulse from 130 to 80. Carbuncles developed on the buttocks and although the patient stood an indwelling catheter well, a month and a half were consumed before the carbuncles cleared up so that a prostatectomy could be done. Case 9462, 85 days, first phthalein, a trace; second, 12 per cent; severely infected urine; very hard arteries; no pulse in the right wrist due to diseased arteries. When this patient was ready for operation, he contracted a severe influenza from which he slowly recovered. Case 14604, 35 days; 72 years old; ammoniacal urine; advanced arteriosclerosis; chronic myocarditis; blood pressure 110/88; intolerant urethra-suprapubic sinus. Blood Wasserman + + Case 15737, 23 days, developed a severe renal infection, chills, fever and sweats. Deducting the number of days consumed in the preparation for operation of these five cases from the total number of days consumed in the preparation of these one hundred cases, the average time of preparation is 9 days. The time to speak to a prostatic about the

anæsthetic to be used at his operation is when the patient is examined and the diagnosis is made. These patients are very conscious of their advanced years, failing health, decrepit physique and exhaustion due to their difficult, painful and frequent micturition. They feel and believe that should they subject themselves to general narcosis, they may never awaken therefrom and eagerly accept block anæsthesia instead of general narcosis, if tactfully explained to them. At times demands were made that could not be complied with, such as "I must be unconscious for I never could stand to see things." As a general policy it is best not to argue with these elderly people and assume a position that they know no more about the anæsthetic best fitted for them than they do about the surgical technique of the operation they are to undergo.

Before the operation the mind of the apprehensive patient must be made calm, almost somnolent. For this it is routine to give morphine one and one half hours before operation and one half hour before admission to the operating room. The dose to be given at these times is to be measured by the degree of mental tranquillity obtained and not the amount of drug given. For the strong, vigorous prostatic inclined to be over-anxious, a quarter or a sixth of a grain of morphine is none too much and perhaps not enough. But for the poor surgical risk whose mentality is dulled by sepsis. it is far too much. Narcotization, if the mentality is dulled enough and the patient a poor surgical risk, may not be needed at all. The patient is not to be told when the operation begins or when it ends and solicitous bystanders are instructed not to ask the patient, "Does he feel that?" or "Does that hurt?" He will let you know if you hurt him. He needs encouragement and not warning.

TECHNIQUE.

The patient is placed on the table flat on his stomach and his hips elevated on a pillow. A caudal block is done and after testing the needle for spinal fluid or blood, 25 to 35 c. c. of a 2 per cent. solution of novocain is injected into the sacral canal. The second and first sacral foramina are then located and into each of them from 8 to 10 c.c. of a one

per cent. solution of novocain is injected. If the caudal block has been satisfactory, no injections are made into the third and fourth sacral foramina. The patient is then asked to turn onto his back, the cushion is removed and a field block done along the inner surface of the pubic bone and along the outer edge of both recti muscles from the pubic bone to the umbilicus. For this one half of one per cent. solution was used. Infiltration along the line of incision in these cases should be avoided. The patients have a low resistance to infection, the infiltration devitalizes the tissue to a certain extent, and when brought in contact with an infected urine produces suitable conditions for wound infection and sloughing. In the large pendulous abdomen, the deposit of the solution in the outer edge of the sheath of either recti muscles together with subcutaneous injection over these areas produces a deeper anæsthesia and more muscular relaxation with less novocain than the promiscuous deposits of large quantities of solution in the deep fat tissues where little sensation exists. To do this it is often necessary to handle the needle detached from the syringe with the same deftness of touch exercised in a caudal or transsacral block. Nevertheless the deeper abdominal anæsthesia obtained and the more complete muscular relaxation amply repays the operator for his time and trouble and effort.

Dangerous toxic symptoms due to the novocain have not taken place in any of the 125 cases. The flushed face, increased pulse rate that so often takes place in caudal block has often occurred. But being of little consequence was not noted on the histories. Vomiting occurred in 9 cases. Whether this was due to the novocain, or to the morphine, or to the large quantities of water given to the patient while on the table, I am unable to say. Vomiting was not accompanied by a rapid, feeble pulse, prostration or shock. All of these patients left the table in good condition and the vomiting was not continued when they returned to their beds.

Prostatectomy under caudal and transsacral block requires no great speed. There is no need of haste. The abdominal muscles are lax, the rectal sphincter is not in spasm, the patient is not becoming more toxic every ten minutes by an ever increasing dose of gas, oxygen and ether.

What is the cause of the absence of hæmorrhage? The anæsthetic, the caudal and the transsacral block. It requires no subtle, astute reasoning to come to this conclusion. Compare the picture of the senile prostate taking a gas oxygen or gas-oxygen-ether anæsthetic with that of the properly blocked patient for prostatectomy. Under general narcosis his blood vessels stand out tense and taut like cables under heavy strain, the skin is red, livid and injected, muscles spastic, breathing stertorous, with a profuse bronchial secretion preventing in no small measure, the normal interchange of gases in the lungs and helping to drown the patient within himself. Compare this with the properly blocked patient resting serenely on an operating table made comfortable with pads and cushions, suffering no pain, muscles lax, breathing normally, pulse in about the same condition as when he left his bed for operation. The tense injected vessels seen in the face and neck of the prostatic under general narcosis bespeaks the same circulatory condition in and around the prostate and hæmorrhage necessarily ensues. Again let it be stated that hæmorrhage is a negligible accident in prostatectomy done under caudal and transsacral block. Perivesical extravasation of a foul infected urine is prevented in every way possible.

Four deaths occurred in the series of 100 consecutive suprapubic prostatectomies done under caudal and transsacral block.

Of the six cases of prostatic sclerosis with contracture of the vesical neck, there was one death.

An analysis of this series of 125 cases warrants the following conclusions:

1. That caudal and transsacral block when properly performed is an agreeable anæsthetic, with practically no toxic manifestation.
2. That caudal and transsacral block is the anæsthetic of choice for prostatectomy.
3. That hæmorrhage, so poorly borne by the senile prostatic, an ever source of danger and a potent cause of death when operating under general narcosis, is a negligible consideration in prostatic surgery, when done under caudal and transsacral block.

4. That the poorer surgical prostatic risks can be operated upon under caudal and transsacral block with the assurance of good functional result and a low mortality.

DISCUSSION

Dr. Jarcho: The field block produced perfect anæsthesia. In Dr. Anderson's paper no mention was made of injecting the space of Retzius. This particular space generally gives discomfort when there is any traction by bladder manipulation. This is caused by failure of anæsthesia in the space of Retzius and the surrounding tissues.

Dr. Goldstein: I was interested from the point of view of anæsthetization rather than that of surgery. One point which has struck me very much is that I believe the country has gone mad about the mortality rate. We should cut that out. We should take up the study of morbidity instead. I do not think it matters whether the mortality is 4 or 5 per cent., but whether we are getting a hundred per cent. of functional results or only fifty per cent. Is caudal anæsthesia or sacral block helping the morbidity rate? Are the rates of morbidity going down, remaining the same, or increasing? One point of advantage Dr. Anderson mentioned is that there is no necessity for hurry because the patient is not under general anæsthesia. I cannot agree to that entirely, because I do not think that an old man of sixty should be kept lying on the operating table longer than we can help. You might get a pulmonary stasis. I think we can hasten the operation judiciously. One point has interested me very much; that is should the surgeon do the blocking, or should he have someone else doing it for him? It is necessary to have a competent man doing the work. A caudal blocking of the sacral sheath should take about thirty minutes at the least. We should consider whether we are keeping the patients thirty minutes longer and compare that with the general anæsthesia. If thirty minutes are required to introduce anæsthesia that point is worth study. I think that perineal prostatectomy is coming back because of sacral anæsthesia. To do an injection of the rectus sheath takes about thirty minutes. I notice Dr. Anderson did not say that he injected the third and fourth foramina when he injected the sheath; yet he

got proper anæsthesia. I have not noticed any difference in hæmorrhage in caudal, as compared with general anæsthesia. One place for caudal anæsthesia is in the poor surgical risk. If you have an old person with no resistence whatever it is remarkable what you can do by taking the prostate out.

Dr. Amster: The other speakers have covered the subject so well that there is very little for me to say. It is well known that patients with prostatic hypertrophy are considered poor surgical risks because they do not apply for treatment until the last moment. We are dealing with an acute auto-intoxication and metabolic changes occur before as well as after an operation. The risk in the first place is on account of age, and second, because of the tendency to acidosis. Ether anæsthesia should be given with caution in the early stage of acute obstruction with retention. I would not use general anæsthesia because of vomiting and dehydration. Acidosis and acetonuria are very much increased. Acidosis occurs in 70 per cent. of ether anæsthesias. Vital changes occur in the adrenals, kidneys, liver, heart and lungs, and should not be prolonged. I have been studying the defects of caudal anæsthesia up to six months ago, then I completely reversed my opinion, but I feel that unless it can be done by an expert it should not be undertaken at all. For the last two years I have employed Dr. Labat exclusively to do my regional work and my results are 99 per cent. successful. I think that when novocain is introduced into the spinal canal that the nerves in that region have special affinity for the drug and suck up the anæsthetic immediately after its introduction. If the fluid migrated upward anæsthesia could not be produced in the organ. We used to be told that it migrated to the medulla if the patient were placed in the Trendelenburg position. I do not think the anæsthetic goes beyond the point of injection. There is no danger if given according to the Labat technique.

Dr. Anderson (closing the discussion): In regard to the field block, I believe I said that we have a field block parallel with the inner edge of the pubic bone and in the midline beneath the pubic bone. In regard to the time of operations I cannot agree with Dr. Goldstein. When we see a man trying to pull out a prostate in six minutes

with profuse bleeding, that is poor surgery. It takes me twenty minutes to take out a prostate. I make the bladder water-tight. I prevent peri-vesical extravasation. I do not see that twenty minutes make any difference. Then I put the patient to bed and give him a clysis. I do not think the perineal cases get such good functional results as the supra-pubic cases. If a man does a spinal block with a blood pressure of 100, it is taking big chances; I think we should do caudal and transsacral block; by the time you have done that you can do a complete block. A man must study anatomy well to do this work, and it requires time and patience. My cases were not picked cases. They came to a general hospital. You cannot operate on these cases under general narcosis.

BRITISH MEDICAL ASSOCIATION MEETING, NOTTINGHAM.[1]

The Section of Anæsthetics of the British Medical Association Meeting held sessions on the mornings of July21st, 22nd, and 23rd, Dr.Samuel Johnston, of Toronto serving as President.

The first meeting of the Section of Anæsthetics of the British Medical Association was held at University College, Nottingham, on July 21st, 1926.

The President, Dr. Samuel Johnston, in declaring the meeting open, extended a cordial welcome to the members of the Section, and particularly the members of the sister association, the Associated Anæsthetists of the United States and Canada. He then called upon Dr. A. L. Flemming (Bristol), to act as his deputy while he read his paper :—

"The Future of Anaesthesia"

Dr. A. L. Fleming (Bristol), after thanking Dr. Johnston for his admirable paper, said he would contravene the custom of the Chair and take the opportunity of welcoming our overseas guests. He said that he was glad that so many celebrated oversea anaesthetists had come to the meeting as it afforded him and his fellow British Anaesthetists the opportunity of picking oversea brains as thoroughly as possible. Dr. Johnston had touched on many vital points but there were still many barriers to be broken down in this country. He was glad to say that in our hospitals the barriers between the various clinical departments were being broken down gradually and he wished he

[1]We are indebted to the British Medical Journal for permission to publish abstracts of articles read at the sessions by the various participants; and for other editorial courtesies. Full papers will, in due course, appear in that Journal.

could say the same about the departments of our Universities. He was very anxious to see closer relations established between anaesthetists both individual and national. The Manchester Exchange was a milestone in the history of British Anaesthesia.

In anaesthesia there must eventually be elimination of chance and art in favour of certainty and science. An art was always more difficult to teach than a science. From the public point of view, the sooner the art can be turned into science, the better, though the time is not yet when the art can be overlooked entirely. He desired to stress the necessity of teaching of anaesthetic drugs and their properties not by the expert anaesthetist, but by the pharmaceutical chemist in the preliminary scientific education of the student. Anaesthetic research committees should be established at every teaching centre and University, and should be run by the collaboration of the physicist, the chemist, the bio-chemist, the surgeon and the anaesthetist. In his experience the ease with which open ether could be given took away the interest of the student from anaesthetics, which was perhaps a pity. He was glad to note that of late years, collaboration between the surgeon and the anaesthetist had greatly increased which was for the good of all concerned, including the patient. He suggested that the nick-name of the place of research of anaesthetic research committees should be, not "the Lab" but "the Collab".

Dr. WESLEY BOURNE (Montreal), desired that at the outset he might be allowed to eulogise the opener's vaticinations, and to express the hope that they would all come true.

Standing as we did, with an immense view of what is, and what is past, the opener had given us much food for thought. He desired to entitle his remarks, "Fostering Research in Anaesthesia". Research is by no means new in anaesthesia as in other things, but research zeal has been particularly keen in recent times. Advances have been made in obstetrical anaesthesia, in insufflation methods and in the many methods of administering anaesthetics generally. The successful employment of the newer gases, our knowledge of the acidosis of anaesthesia, of heat regulation, water exchange, the technicalities of the procedures of regional anaesthesia, the uses of

carbon di-oxide, of alpha-lobelin and the borocaines were all advances. The opener had remarked on impurities in anaesthetics and by chance the results of work done in the McGill University on the effects of certain compounds on respiration, blood-pressure and recovery when known quantities are added to pure anaesthetic ether, had just come to hand.

Acetaldehyde in concentration up to one half per cent hardly affected respiration, but with one per cent or over the breathing was embarrassed both audibly and visibly as could be seen from tracings. Even after three hours administration the blood pressure was not much affected. Consequently it can be assumed that old or impure ether containing never more than one per cent would have no effect on respiration, blood pressure, or recovery even after prolonged administration.

With ether peroxide, concentrations of one half per cent or over give definite effects in very short time, the effects becoming more marked the longer the administration. Respiration became embarrassed, and the blood pressure fell. In one case, after an hour's administration the heart stopped permanently. In concentrations of less than one per cent the effects were negligible but with high concentrations the blood pressure was extremely depressed. Ether peroxide is therefore only harmful when the concentration exceeds one half per cent.

In the case of the sulphur compounds, ethyl niercaptan does not materially affect animals even after 3 hours administration, when present to the extent of one per cent, but in the case of ethyl sulphide the presence of one per cent of this impurity both affects respiration and blood pressure and the animal died twelve hours later of severe entiritis. In smaller concentrations up to three tenths of one per cent no effect on blood pressure or respiraiton is caused.

The Ketones, Acetone ethyl-methyl and di-ethyl cause no disturbance up to five per cent concentration.

It has been shown as the results of research at the McGill University that if the room temperature be increased to 91.4° F. and fluids be administered, an animal under the influence of ether narcosis will suffer no loss in body temperature and no changes in blood solids. Morphine administered prior to anaesthetisation prevents blood concentration which fits in

well with observations of Professor Stehle and himself that morphine prevents disuria and anuria.

Such temperatures as mentioned above are impracticable for ordinary operative work, so diathermy has been tried in lieu.

The initial depression of body temperature after ether was followed by a rise to one above normal after 800 to 1000 milliamperes but no decided effect on blood concentration was noticed. If applied before etherisation the body temperature was rapidly increased. Ordinary acidosis of anaesthesia was unaffected by changes in body-temperature.

Dr. H. M. COHEN (Manchester), then read his paper

Mr. C. W. MOORS (Toledo), then followed with his paper on "Co-operation with the Surgeons." He stated that a visit to the Toronto General Hospital had convinced him of the righteousness of the reputation for leadership which that institution enjoyed. It was a far step from that to the conditions of but a few years previously, when the family physician, who probably administered one or two anaesthetics a year, accompanied the patient to the hospital to see that the anaesthetic was safely given. While being encouraged by the fact that a number of hospitals had fallen into line and were turning out a considerably increased number of trained anaesthetists he wished to suggest better organisation for opportunities in practical Post-Graduate work in anaesthesia. To this end he had placed the 2600 beds under his supervision at the disposal of doctors desiring advanced work in anaesthesia, Dr. McKesson and his associates supervising all administrations. The entire surgical staff gave complete and sympathetic support to the idea of professional anaesthesia instead of claiming a monopoly of the knowledge of anaesthesia while being content to teach the ideas of twenty five years ago according to the old text books. The Surgeons moreover recognise that good surgery can be accomplished without the necessity of the patient being in a state of shock, and that by operating under local anaesthesia they will acquire the caressing touch of the Master Surgeon.

Dr. A. L. FLEMMING (Bristol), asked how the ether was administered in Dr. Bourne's cases.

In reply, Dr. BOURNE said that it was in a cabinet for induction with maintenance by ether sprinkled in a loosely folded towel.

DR. R. E. APPERLEY (London), asked what was the effect of aldehyde. Recovery showed irregularity of breathing accompanied by struggling. Minute traces caused sickness and struggling during recovery. He stressed the necessity for co-operation between the surgeon and the anaesthetist when local and regional anaesthesia was employed.

Dr. MCMECHAN (Avon Lake Ohio), paid a tribute to the General Secretary of the Association to whom he attributed the fact that so many overseas anaesthesists were present at the present discussion. He opined that the barriers between different departments had been broken down because anaesthetics were necessary for research work. Consequently workers became converts and joined with anaesthetists in attempting to secure the abolition of needless deaths on the table. This must be supplemented by the abolition of needless deaths during the next seventy-two hours. As regards teaching, even our best anaesthetists are limited to certain technical performances. The patient has good surgery and good anaesthetisation, but no good doctoring afterwards. The anaesthetist should determine the preparation of the patient, the administration of the anaesthetic and the post-operative period, thereby relieving the surgeon of much work which he has neither the time nor the inclination to accomplish satisfactorily.

Dr. S. R. WILSON (Manchester), said it was difficult to deal with the various papers read as they covered such a wide field. He had a great belief in the value of the printed word referred to in Dr. Cohen's paper, most of the advances during the last century being due to this, but meetings such as the present one also had their value even when it entailed a loss of revenue to those who attended them. He urged that even at such a loss meetings were worth while. As regards the administration of ether, he did not agree with Dr. Flemming that open ether meant a loss of interest in anaesthetics among the students. His own complaint was that if anything, the student took too much interest in things anaesthetic. Dr. Moot's work had

saved his (Dr. Wilson's) reputation on at least two occasions which he recounted in full.

The lack of co-operation between the physician and the anaesthetist is a blot not on anaesthetists but on physicians. The physician thinks too much of the systolic pressure—he must take the diastolic equally into consideration.

In reply Dr. JOHNSTON stated that the brain picking was really the object of the visitors, not the visited. He described fully the story of how a crow was picked during the civil war. Art cannot be taught; it is inherent in the individual. Science wedded to art brought forth the perfect anaesthetist. Pharmaceutical chemistry should certainly be taught in departments other than the anaesthetic. The duty of the anaesthetist was to teach his pupils how to give anaesthetics safely and comfortably. There was a vast difference between being in a state of anaesthesia and being quite dead to the world.

Even under open ether shock and loss of blood may cause a fatality. He acknowledged the valuable work of Drs. Moots and McKesson, and also that of Drs. Bourne and Staley, who had produced an ether free from impurities which acted perfectly as an anaesthetic, (despite assertions that ether failed to produce narcosis,) and with little subsequent nausea and vomiting. He agreed with Dr. Apperley as to the advantages of regional anaesthesia, but in selected cases only. The trouble is that it had been wrongly used e. g. in toxic goitre cases.

Dr. McMechan was more than an anaesthetist : he was also a physician and one of the best loved characters in American anaesthetic circles.

Dr. S. R. WILSON interposed to deplore the fact that the physician was too often lost sight of altogether. He quoted two cases, in one of which the information given by the physician was quite useless and in the other, the information given was of great use, though not acted upon.

At the second session in the afternoon of the 21st July, 1926, Dr. McMechan read his paper on "The Newer Anæsthetics." Dr. McKessen followed with a paper on "Guiding Signs and Dangers."

Dr. J. D. GOLDMAN (New York City), stated that he did not indicate that the reduced oxygenation present in N_2O—O_2 anaesthesia was always harmful, but in the handicapped patient, unavoidable sub-oxidation endangered health. After extensive trial he believed that ethylene required much less sub-oxidation than N_2O, in fact, anaesthesia can be maintained with it and with acetylene oxygen with no sub-oxidation whatever.

Crile before 1920 frequently pointed out the suboxidation produced by N_2O—O_2.

The introduction of ethylene marked a definite step in advance, but acetylene oxygen marks an even greater advance and one he heartily recommended. It is important to remove the acetone in which the acetylene is dissolved. Rebreathing and even added C O_2 are useful. Propylene is a disappointment. It held out hopes that had not been fulfilled and a warning had been issued against its clinical use in the present state of our knowledge of its properties. He believed in the value of acetylene in dental surgery, though it needs special precautions in view of its inflamability. Induction is commenced with N_2O and after a few breaths the inhaler is more closely adopted and the mouth covered with a slighly moist towel. Acetylene and oxygen are then added, the percentage being acetylene 50, oxygen 20, Nitrous oxide 30; as anaesthesia continues the acetylene is reduced and at the end the patient receives N_2O—O_2 sometimes with 5 per cent or less of C O_2.

With N_2O—O_2 anaesthesia can only be maintained If the O_2 is in the vicinity of 5 per cent. With less than this, anoxic anoxaemia appears, with more, vocalisation commences. As Griene says—the respiratory reactions, the cardiac rates and the periphsial vascular changes are all similar in N_2 O—O_2 anaesthesia and in simple anoxaemia.

The same is true in most ethylene administrations. It is necessary to lay stress on these dangers not because they are

unknown, but because they are in danger of being forgotten. To summarise. In ethylene anaesthesia the oxygen saturation can often be kept normal. In N_2 O—O_2, the saturation can never be kept normal. In N_2 O—Acetylene—O_2 anaesthesia it can be kept normal, which means that acetylene removes the anoxic factor from N_2 O—O_2 anaesthesia.

Dr. S. R. WILSON (Manchester), said he had not much sympathy with the electro-chemical theory of anaesthesia. The metabolic theory was, however, deserving of careful consideration by all interested in the newer anaesthetics. He desired to call attention to the analogy between hibernating animals and those in a state of anaesthesia, as also bewteen the latter and trance conditions of Indian Fakirs, hypnosis and allied conditions.

He wished to know if the newer gases would accomplish more than does N_2 O. In the first place one must be sure of the purity of the new gases. With ethylene the blood colour could not be relied on as C O gave similar results to ethylene. He believed that propylene was definitely out of court as an anaesthetic. Acetylene had disadvanatges in being highly explosive and difficult to purify.

He agreed with Dr. McKesson as to the uses of ethylene and particularly in the cases of the very old, the very young, and in diabetics. As regards the slowing of the pulse due to ethylene he enquired whether this was the case in those suffering from exophthalmic goitres, as if so, he thought there was here a field of usefulness for the drug.

Dr. SMITH (Nottingham), enquired whether the new gases were being given experimentally or whether they had superseded N_2 O—O_2 anaesthesia. In what cases are N_2 O—O_2 given, e.g. abdominal, and has N_2 O—O_2 entirley superseded ether and O_2.

Dr. JOHNSTON intervening replied to the last speakers questions, indicating that in almost all cases at his hospital N_2 O—O_2 had superseded ether and O_2. The chief exceptions were the alcoholic group—a fast dying out group perishing rapidly from "moonshine".

Dr. MCKESSON in reply stated that ethylene does not slow

the pulse in hyperthyroidism, which was unfortunate. He recommended the reduction of metabolism before operation in these cases by rest, morphine and scopolamine. One quarter of a grain of morphine reduces metabolism by ten per cent. Atrophine should not be given as it counteracts the effect of morphine. As regards the metabolic theory, if applied in clinical work it should be helpful.

Nitrous oxide—oxygen—ethylene—oxygen are extensively used in Toledo. In 1925 he had not used ether in a single case and so far this year had used it in 5 or 6 cases only.

Dr. L. GREENBLUM (Akron, Ohio), stated that in his opinion the papers needed study, being largely technical. For his part he wished that surgeons rather than anaesthetists had been present at the meeting. He described a fatal case in his practice due to an unsuspected growth in the diaphragm in a fat negro woman whom against his better judgement he had been forced to anaesthetise.

Dr. MCMECHAN in reply stated that the interpretation of phenomena depended to a great extent on the point of view of the interpreter, e.g. the physiologist interpreted physiologically, the physicist from the physical standpoint. It was the duty of the anaesthetist to seek out the people who are doing and finding out things not caring whether the theories of the workers were correct or not. N_2 O_2 anaesthesia suffered from one basic fault in that everyone imagined that a satisfactory anaesthetic could be induced without preliminary preparation. It is necessary that the patient be receptive of the gas type of anaesthetic. The patient must have a blood stream capable of receiving and using gas. Consequently we must know something of the metabolism of the patient. Patients with myocardial degeneration do not like anoxaemia, hence N_2 O—O_2 may fail unless the patient is treated with digitalin.

Gas anaesthesia is difficult to give in cases with sepsis, acidosis, ketosis and other forms of toxaemia. The purity of the N_2O may also make a difference, for if there is only a one per cent lee-way in a patient the controlled rebreathing method combined with pressure may be necessary to control the patient's metabolism. The problem of anaesthesia to-day for the anaes-

thetist is to realise that it is impossible to give an anaesthetic well unless the basic signs of the physiology of gases are known.

Before declaring the meeting closed the Chairman called upon Dr. Hennessy to say a few words as representing the Irish House of Parliament.

Dr. HENNESSY said that the problem in Ireland was that the Irishman spoke in English but thought in Irish, a fact the Englishman did not understand. He welcomed the chance of saying a few words as he was sure that these meetings helped to foster an understanding between the two nations whose relations with one another were gradually becoming much better. He saw no reason to wish for better relations than those already existing between the lesser Ireland here and the greater Ireland overseas for the United States contained more Irishmen than did Ireland to-day.

The PRESIDENT ELECT of the British Medical Association SIR ROBERT PHILIP, then addressed a few words to the members of the Section as a representative of that maligned body—the Physicians.

SIR ROBERT PHILIP, called upon by the President, said that, without the courteous invitation they extended to him, he would have considered it almost impertinent for one who belonged to the physicians—who had been qualified with considerable frankness during the discussion—to offer any remarks to so influential a body of experts.

The subject of anaesthetics had interested him deeply since the time—now more than forty years ago—when he acted for a prolonged period as anaesthetist to that distinguished pioneer of ovariotomy—the late Dr. Thomas Keith of Edinburgh. It was the fascinating recollections of that by-gone experience and a chance conversation the other night with the delightful exponent of modern anaesthetics, Dr. McMechan of Ohio, which had led him to visit the Section to-day.

The satisfactory practice of anaesthetics rested ultimately on physiology. It was a department of scientific medicine. The sound anaesthetist must be a physician in the best sense of the word. He occupied a peculiarly interesting position, in that he bridged the wide gap which had been constituted in the

past by the artificial divorce of medicine and surgery. The anaesthetist was an indispensable colleague of the surgeon. He could only play the part effectively in proportion as his training and outlook were those of the physician.

With scientific guidance of this quality the surgeon could afford—both prior to, and during, an important operation—to limit his personal care to more strictly surgical considerations. The operating theatre recalled the unity of medicine and restored just and proper relationships between physician and surgeon.

It was a significant fact that the British Medical Association had devoted a Section to Anaesthetics. There were many reasons in favour of maintenance of the Section. As President-Elect of the Association in 1927, when they looked forward to celebrating the centenary of Joseph Lister at Edinburgh, which was the scene of his most fruitful labours and no less the home of James Young Simpson, he earnestly hoped they might count on the presence of an equally strong representation of scientific anaesthestists.

The third session of the Anæsthetic Section was held in the morning of July 22, when under the Chairmanship of Dr. S. R. Wilson (Manchester), Dr. F. W. Price (London) opened the discussion with a paper on "Anæsthesia in Relation to Cardio-Vascular Affections."

Dr. Price was followed by Dr. J. Blomfield (London) who discussed the same subject.

He stated that after an experience of some twenty-eight years he was struck by two facts. The first, the number of patients handled who had been told by their doctors that they "could not stand an anaesthetic on account of the heart", and the second—the minute space occupied in the list of anaesthetic fatalities by chronic valvular disease of the heart though practically every variety of chronic valvular disease has been present in one or other of patients who have passed safely through anaesthesia. Speaking generally, such patients give no difficulty to the anaesthetist, probably owing to the fact that they pass easily into anaesthesia owing to poor physique.

The risk must, however, not be underestimated when "compensation" has broken down, but even then if operation is necessary, the anaesthetist need not refuse the risk, since there is always some form of anaesthesia or analgesia to meet the case. The anaesthetist is not expected or required to diagnose the particular cardiac affection present, but he must be able to state whether the case is suitable for an anaesthetic at all, and to decide what, when, and how the anaesthetic was to be given. The most important symptoms in a cardiovascular case from the anaesthetist's point of view is breathlessness. When the patient cannot lie supine with one pillow under his head without becoming breathless the case is a dangerous one to handle. In such a case the anaesthetic must be given in the position in which the patient can breathe the most easily, there must be no air-limitation during anaesthesia. The asphyxial element in these cases is dangerous and all spasm in the early stages of narcosis must be avoided, and it is the danger of spasm which makes nitrous oxide gas and oxygen inapplicable in some of these cases. Even pure chloroform is preferable in these cases if quiet narcosis can thus be obtained. If the operation is prolonged, oxygen should be given in addition, and an unobstructed airway secured. A good test of the absence of breathlessness is to make the patient hold the breath as long as possible after a deep inspiration. If the breath cannot be held for at least 30 seconds then the patient has a heart muscle which is likely to fail if exposed to any operation or anaesthetic. Auscultation may possibly confirm the risk. Chloroform should be avoided in such cases and some ether should be used. Patients with feeble heart muscle whether due to faulty change or myocardial degeneration, excessive obese patients and those suffering from prolonged sepsis are all dangerous subjects for anaesthetics. The cardiologist is needed in myocardial degeneration cases without marked symptoms. In all cases the anaesthetist should examine the patient if possible on the day previous to operation, and should test the effect of exercise on the cardiac rate. Undue pulse rapidity just prior to operation may be due to nervousness, or it may be the result of over indulgence in tobacco. In the latter case the rate will not be slowed by the anaesthetic. Rapidity associated with hyperthyroidism is a

dangerous condition and special measures have to be taken prior to operation. Slow pulses are usually favourable to inhalation anaesthesia. In the absence of symptoms and a toxic condition no unusual precautions are necessary. If the result of heart block the condition is more serious but not necessarily an absolute bar to anaesthesia. Irregularity of the pulse in the absence of other symptoms need not concern the anaesthetist. If extreme or there is undue rapidity a cardiologist should be consulted.

It is remarkable how few accidents are attributable to the presence of high blood-pressure, considering that such cases are prone to violent spasm and breath-holding during induction, with consequent rise in blood pressure, and the speaker had been able to trace only two such cases in the literature. Unduly low pressures may result in syncope the result of further anaesthetic lowering. In extreme case the pressure should be raised by intravenous infusions and warmth before operation. These cases cause anxiety later when the stimulation of the anaesthetic has worn off. Preanaesthetic injection of morphia in these cases should be avoided on account of its danger, while with high pressure it is indicated accompanied by scopolomine. Aneurysm cases muscular excitement must be avoided.

The newer anaesthetics, ethylene and propylene would appear to have advantages in cardiovascular conditions, in that they can be given with plenty of oxygen and produce no spasm. Experience with them is, however still very limited, and a definate opinion on their merits is not yet possible.

Dr. Med. Ernst Von der Porten (Hamburg), agreed that cardiovascular diseases were of more interest to the anaesthetist than valvular diseases. In his opinion there were two points that needed to be insisted upon in these cases. The first was that the patient must be prepared carefully and morphia and atropine used with judgement. The second was that the general anaesthetic should be as light as possible especially in dealing with thyroid cases.

Dr. A. L. Flemming joined issue with Dr. Blomfield when he stated that the diagnosis of the heart condition by the Anaesthetist was not necessary.

The breath holding test was taught to him by a teacher, now dead, in 1897.

He stressed the importance of a quiet induction in cardio-vascular conditions, taking plenty of time to avoid spasm and consequent heart strain.

Dr. Mary Botsford (San Francisco) said that yesterday the President-elect had claimed us as Physicians and it was important that as physician anaethetists we should know more about cardiac diseases. In most cases there was not enough preoperative examination and careful selection of the anaesthetic to be given. There should always be consultation between the surgeon and the anaesthetist. She pleaded for nitrous oxide and oxygen as the anaesthetic of choice for induction after preliminary hyperdermic medication, and asked Dr. Price's help in the diagnosis of cases of status lymphaticus.

To avoid psychic shock she insisted on the desirability of the anaesthetic being given in a room other than the operating room.

Lady Berry, (London) said she rarely gave anaesthetics in cardio-vascular cases without a physicians examination. In cases of tachycardia with cyanosis the patient could often be prepared to take an anaesthetic by rest and the exhibition of digitalis. She objected to morphia as a preliminary hypodermic but always gave atropine.

Slow induction is very important and she always gave open ether. She disliked nitrous oxide and oxygen in goitre cases. She had made enquiry of patients as to the impression made by slow induction and elicited the fact that induction with open ether does not seem long. She believed in very light anaesthesia, following the respiration carefully all the time, but the anaesthesia should be really a surgical one.

Dr. H. M. Cohen (Manchester), asked whether the systolic, the diastolic or the pulse pressure was the most important. In France during the war the test for the French Air Force recruits was "breath-holding" extending to 45 seconds.

Dr. Bramwell Manchester), said that the pulse was the most valuable indication to anaesthetists and cardiologists. Irregularity of pulse was merely an outward sign of a more profound disturbance of the circulation and heart mechanism as a whole. Syncope was due to disturbance of the vaso-motor mechanism

rather than to a preliminary disturbance in the heart. If aortic disease, Stokes-Adams syndrome, fatty and fibroid degeneration were excluded it was rare to find a syncope due to the heart rather than the vaso-motor mechanism. As regards bradycardia, a man is a good athlete because he has a bradycardia. A man with a pulse rate of 50 or less, increased by exercise to 150 has a three to two advantage over a man with a pulse rate of 75 increased by exercise to the same extent.

Pulsus alternans was of very grave significance when not associated with a rapid heart rate.

Dr. Featherstone, (Birmingham) said that cases wth extra-systoles go through ether anaesthesia well and in many cases the extra-systoles disappear. He discribed a case of a large heart with cyanosis died under ether. High blood pressure imposed great responsibility in the choice of an anaesthetic. Chloroform was certainly a bad choice, as was spinal anaesthesia.

Dr. Wm. Phillips (Newcastle-on-Tyne) quoted a case in which he advised that a local anaesthetic or sacral analgesia should be given in a case of piles complicated with uncompensated aortic disease. The surgeon demurred and open ether was given. Shortly after being put back to bed, the patient died

Dr. Fairlie (Glasgow), stressed the importance of assessing the risk before giving anaesthetics. He desired to have Dr. Price's opinion as to the risks following anaesthesia. The bad risk patient was troublesome not so much on the table as afterwards. He was in favour of the anaesthetist being guided by the opinion of the physician.

Dr. McMechan (Avon Lake, Ohio), opined that anaesthetists should be cardiologists but believed that even then in some cases the expert cardiologist would have to be consulted. He felt that the anaesthetist had a position to fill between the first visit of the patient to the cardiologist and his return to the cardiologist after operation.

He then gave an explanation of cardiac function from what he called the engineering view point, whch interested the audience.

Dr. S. R. Wilson (Manchester), stated that there should be co-operation between the Physician and the Anaesthetist, the choice of anaesthetic to remain with the Anaesthetist under the direction of the Physician. He found preliminary treatment with digitalin very useful in these cases. He desired to have the opinion of Dr. Price on the influence of atropine and morphia respectively on the heart block.

In reply, Dr. Price said that it was of vital importance to recognise the type of heart irregularity. Extra-systoles tend to disappear with increase of heart rate, and by themselves are of no serious significance. The heart offers no explanation of the cause of fatalities in cases of status lymphaticus. It was his custom to view the systolic, diastolic and pulse pressure together. It must be remembered that in Aortic incompetence there was normally increased blood pressure and pulse pressure and these should not be reduced for fear of syncope. Bundle branch block is not so frequently associated with pulsus alternans as intraventricular block. Venesection is very useful in cases of supernormal blood pressure. Risks certainly follow anaesthesia in such cases. Atropine would appear to have no influence on heart block.

The chair at the afternoon session was taken by Dr. McCardie (Birmingham), when Dr. McKesson read his paper on some new apparatus.

A discussion followed to which Dr. McKesson replied.

Dr. S. R. Wilson (Manchester), then gave a lecture on the Evolution of Anaesthesia. He stated that after such strenuous work as had been done by former speakers he thought that it might prove acceptable if he were to touch for a short time on the lighter side of anaesthesia and he proposed to do this with the help of lantern slides. But first he desired to suggest the need of improvement in Dental Anaesthesia especially when the operation was carried out in the dentist's room or the patient's home, where an operating theatre was not available. Preliminary preparation was most important. It must be remembered that the surgeon was working against time. There must be no risk to the life of the patient either from the operation or the anaesthetic. Recovery must be rapid and the patient, if not already there, able to go home in a short

time. The case was complicated in that the area of operation was common both to Surgeon and Anaesthetist. It must be remembered also, that suddenly and without warning the Dentist might be faced with a situation of such difficulty as would require, if a general Surgeon were dealing with the case, an anaesthetic lasting as long as two hours.

He noticed that a committee was now sitting to investigate the impurities in Nitrous oxide gas as commonly provided, and the effects of these impurities on the patient. He would like to draw attention to a paper published as long ago as 1914 on this very subject by two Manchester Dentists, Hart and Minshall, which was full of information which had been practically ignored by the profession. The reports of the Committee so far published were less full of information than that of the two investigators he cited. However, the way of the pioneer is always difficult, and in his own experience it had taken twenty years to convince the authorities of the necessity of setting up a Committee of enquiry into Mule-Spinner's Cancer, a condition he had described when a House-Surgeon. The Speaker then passed on to the subject of his lecture, "The Evolution of Anaesthesia."

The first surgical operation on record was the one in which during a deep sleep Adam had a rib removed, as recorded in Genesis. The type of Anaesthesia was not mentioned, however, so presumably hypnosis was employed. There were three periods in the evolution of anaesthesia. The first or pre-anaesthetic period dated from 1850 B.C. to 1776 A.D., the second or Dawn of anaesthesia dated from 1776 A.D. to 1844-6 A.D., while the third or period of anaesthesia proper dated from 1846 to the present day.

Homer or Melisagenes the blind poet of Chios flourished in Greece circa 1850 B.C., and the first reference to anaesthesia proper occurs in the Odyssey, the anaesthetist being Helen of Troy who placed a drug in the wine whereof the soldiers drank. Herefrom we learn the lesson of preanaesthetic medication. Talking of this, why has there been so much discussion on preliminary medication? Pawlow's work may eventually lead to the clarification of our knowledge on these subjects. Contrary to the usually accepted ideas, bromides act by brain stimulation and not by brain depression, and in the speaker's opinion,

caffeine will probably give us the drug we have been looking for all these years. Strychnine acts like caffeine.

Orpheus was the first example of one who managed his patients by psychological methods, whereas when Elijah restored to life the widow's son, he applied the excellent method used in anaesthetic overdose, and one which the speaker had employed with success on several occasions, oral insufflation by means of a tube, at the same time compressing the nostrils, This method could be employed almost anywhere where sur- rubber tubing which was practically always at hand.
gical operations were done, as no elaborate apparatus was necessary since all that was needed was a couple of feet of

Galen who flourished between 130 and 200 A.D. for a thousand years and supplied Europe with all that Europe knew of Medicine, was practically silent on the subject of Anaesthesia. He merely stated that mandrake had the power to paralyse sensation and motion.

On the other hand, Dubartas (1544-1590) gave a perfect picture of anaesthesia in one of his poems. The Speaker as a youth had a very poor opinion of poets as a race, but in his comparative old age he was being converted into thinking that after all they might have some use, and he even almost admitted that he was able to see beauty in some of their compositions.

A certain William Shakespeare in a play called "Cymbeline", Act I Scene VI, depicts the Queen, wife of Cymbeline, in consultation with one Cornelius, a physician. She was a lady of racy language, who reminded him of the Duchess who had not hitherto taken part in the conversation. She says, "Having thus far proceeded, (Unless thou thinkest me dev'lish,) is't not meet that I did amplify my judgement in other conclusions? I will try the forces of these thy compounds on such creature as we count not worth the hanging, (but none human,) To try the vigour of them, and apply allayments to their act; and by them gather their several virtues and effects. Cornelius is, however, doubtful of the bonafides of the lady, and after receiving his conge says in an aside "I do not like her. She doth think she has strange lingering poisons: I do know her spirit, and will not trust one of her malice with a drug of such damned nature. Those she will stupefy and dull

the sense awhile; which first, perchance, she'll prove on cats and dogs. Then afterwards up higher: but there is no danger in what show of death it makes, more than the locking up the spirits a time, to be fresh reviving." Here then we have an excellent definition of what an anaesthetic should be, and moreover the true spirit of scientific research, dependent on experiments with animals.

The Dawn of Anaesthesia commenced with Priestly, who destined for the Church, renounced this idea and became a scientist. Possibly the emanations from a neighbouring brewery had something to do with the tread of his researches and led him to the discovery of nitrous oxide and other gases, for he was born near to a brewery. Priestley was, however, apparently unaware of the anaesthetic properties of his discovery, and it was left to Sir Humphry Davy to suggest that the gas might be used to lessen the pains of surgery. The suggestion, however, lay buried in his works, a page of which the Speaker threw upon the screen, and it was not until Henry Hill Hickman devoted his short life to researches into Carbon dioxide, Nitrous oxide and asphyxia, (he was born in 1800 and died in 1829), that Davy's suggestion was carried into practice. The inborn opposition of the profession as a whole to any novelty was as strong in those days as in any other period of the history of medicine, and Hickman's discoveries were neglected and almost laughed at. He went to Paris where he was met with a little more sympathy and a Committee of the Academy of Medicine there was appointed by the King to enquire into his discoveries and to report thereon. But nothing further ever came of this second attempt of Hickman and he died a few years later a disappointed man.

Crawford Long took up the tale a little later and it is remarkable that it was his fortune to lead a placid and happy life and to enjoy a contented old age. On the other hand, Horace Wells and William Morton both went through a short, stormy and embittered career, in fact, it would appear as though the pursuit of anaesthesia by the pioneer workers in that art were dogged by a malignant and malevolently implacable Fate which eventually impelled those in search of the relief of pain during surgical operations to end their careers by a self inflicted death after a life of intolerable distress and disappointment.

A hearty vote of thanks to the readers of the papers was proposed and carried with acclamation, and after Dr. Rawlings had given a demonstration of a new apparatus for the giving of chloroform of any desired vapour strength, the meeting broke up.

The Session on the 23rd July was devoted to a joint meeting of the Surgical and Anaesthetic Sections. At the desire of the President of the Surgical Section, Sir James Berry, Dr. Johnston, President of the Anaesthetic Section occupied the Chair. Professor Finsterer (Vienna) opened the discussion with a paper on Splanchnic Anaesthesia for Gastric Surgery, and was followed by Mr. Moots (Toledo) with a lengthy paper on Evaluation of Risk, Blood Pressure Protection, Nitrous Oxide Anaesthesia as Vital Factors In Gastric Surgery. Dr. C. Langton Hewer (London) then discussed Endotracheal Nitrous Oxide-Oxygen-Ether in Gastric Surgery. Several Speakers followed, and the meeting was apparently divided into two camps. The first and by far the most numerous camp was held by those who deemed it desirable that the Surgeon and the Anaesthetist should cooperate with each other before, during and after operation. A somewhat lonely Achilles in the opposite camp opined that the operation was the surgeon's, and that he alone was responsible to the patient. He believed that "team-work" fetish was being done to death. The surgeon had the right to dictate the anaesthetic he preferred in any particular case.

As regards particular methods of anaesthesia it appeared that individual members of the Sections had their favourite methods in routine cases, and the majority were quite satisified with these, but were willing to try any other methods in cases which seemed to them likely to be benefitted by a change from the routine.

The meeting broke up after a lengthy Session with a vote of thanks to all who had spoken, and who had done so much to lay their views before the members of both Sections.

The Nottingham Meeting in brief.

Perhaps never in the history of anaesthesia has there been held a more successful Section than that at Nottingham during the British Medical Association Meeting, on July 21st, 22nd

and 23rd. The gatherings were large, and correspondingly enthusiastic, and the programme for each day proved of the highest quality.

The President of the Section, Dr. Samuel Johnston, of Toronto, turned the Chair over to Dr. A. L. Flemming while delivering his presidential address on The Future of Anaesthesia and during the discussion which followed. Dr. S. R. Wilson took the Chair on the morning of the second day, and Dr. McCardie on the afternoon.

Dr. F. H. McMcehan, the Secretary General of the Associated Anaesthetists of the United States and Canada, and who was at the head of the American delegation, was in frequent demand throughout the Meetings for a number of interesting and instructive talks. These were not limited to the Anaesthetic Section but proved equally a feature of the more general gatherings. Dr. McMechan spoke in highest terms of the value of the Nottingham Congress and stated that he regarded this as the peak-line of Anaesthesia.

In expressing the thanks of the American visitors Dr. Samuel Johnston hoped that British Anaesthetists would find it possible in the near future to return the compliment by coming over to America.

During the second day's afternoon session Dr. McKesson of Toledo, demonstrated his gas-oxygen apparatus; Dr. Julius Goldman of New York explained his device for calibrating the exact flow of several gases on the Gwathmey apparatus; and Dr. S. Thompson Rawling of Leeds, exhibited a new anaesthetic table with complete equipment.

The Americans, having previously visited Dublin, London, Glasgow and Edinburgh, left Nottingham for Paris on the 24th. After remaining in that city for a week they leave for Copenhagen, thence they visit Germany and then home. At London they were entertained at an anaesthetists dinner and took part in several meetings. At Glasgow they joined the Scottish Society of Anaesthetists in their annual meeting.

In proposing the toast of the guests at the annual dinner, Dr. H. D. Brackenbury, Chairman of Representation Body, said that one of the most enjoyable features of the Meeting was the fact that the anaesthetists had taken this occasion to hold an International Congress at the invitation of the British Medical Association, and that he had been assured that this Congress had proved one of the most successful advances in the speciality of anaesthesia during the last quarter century.

In proposing the health of the visitors he mentioned Dr. Samuel Johnston of Toronto. Although a member of the British Medical Association, and heading the official Canadian delegation as an anaesthetist, he had been instrumental in securing the approval for the British Medical Association 1930 meeting in Winnipeg, at which time it was hoped the anaesthetists of Great Britain would be able to reciprocate the visit of their over sea visitors.

Also he wanted to mention Dr. F. H. McMechan as having been the leading spirit in the organization of the present Congress, and he wished to extend to him the appreciation, sympathy and affection of the British Medical Association for this co-operation.

The following is a full list of the attendances at the Anaesthetic Section; British Medical Meeting.

Dr. Samuel Johnston,
„ R. E. Apperley,
„ A. L. Flemming,
„ F. H. McMechan,
„ C. Langton Hewer,
„ C. A. Wells,
„ J. Johnston,
„ E. W. Strange,
„ R. J. Clansen,
„ E. H. Mott,
„ C. B. Thomson,
„ W. J. McCardie,
„ H. Featherstone,
„ W. Attler,
„ H. M. Cohen,
„ Lamova Shuey,
Dr. H. G. Dodd,
„ E. Tate,
„ Wm. J. Phillips,
„ Evelyn Popper,
„ T. B. Gilbert Smith,
„ R. G. Springer,
„ E. I. McKesson,
„ Mary Botsford,
„ S. R. Wilson,
„ Louis Greenblum,
„ E. von der Porten,
Mrs. F. H. McMechan,
Dr. Huldah M. Wyland,
„ W. Dickinson,
„ H. P. Fairlie,
„ R. B. Hammond,

„ Wesley Bourne,
„ R. W. Herrick,
„ L. Crombie,
„ H. Pinto Leite,
„ Leo Dilicate,
„ Alec. P. Wilson,
„ T. W. Smart,
„ J. Elphinstone,
Mrs. J. Elphinstone,
Dr. T. D. Goldman,
„ W. J. Bennett Jones,
„ Dennis Jordan,
„ D. D. Mackintosh,
„ C. Dudley Bishop,
„ J. Milligan,
Dr. J. P. Hastilow,
„ R. Farh Pinson,
„ P. P. Dalton,
Sir R. Phillips,
Dr. Hennessey,
„ I. R. Spark,
„ Price,
„ Hugh Kelly,
„ A. Asher,
„ A. Lyndon,
„ J. Blomfield,
Lady Berry,
Dr. Smart,
„ J. Crighton Bramwell,
„ P. S. Buchanan,

The Americans in Scotland.

The Scottish Society of Anaesthetists on hearing, early in the year, that there was a probability of a visit from a party of anaesthetists from the U.S.A. and Canada, decided to postpone their Annual Meeting till July in order to leave open the opportunity of having those prospective visitors at the meeting. This turned out to be a wise decision, and led to a most interesting and enjoyable meeting on 6th July, the day of the over-seas visitors arrival in Glasgow. The meeting was held in Glasgow, members of the Society in Aberdeen, Dundee, and Edinburgh travelling through to take part. The morning was given up to visits to the Royal Infirmary and the Royal Hospital for Sick Children, where demonstrations had been arranged by Dr. Fairlie and Dr. Ross McKenzie, the latter prefacing the demonstration of gas oxygen anaesthesia combined with C O_2 administration, with a short paper illustrated by lantern slides.

In the afternoon the venue of the meeting was the Royal Faculty of Physicians and Surgeons' premises, where a room had kindly been provided. The President of the Scottish Society occupied the Chair and delivered an address dealing with many of the problems with which the anaesthetist is

faced, special emphasis being given to the question of the teaching of anaesthetics.

The address was singularly inspiring and instructive, and left its hearers with a feeling of deep regret that anaesthesia was about to lose the services of Dr. Ross. It is to be hoped that this will not also involve his loss to the Society where he has been a conspicuous figure since its incepton., and for which he acted for many years in the capacity of Secretary.

The paper was followed by a discussion in which some of the overseas visitors took part.

A Paper was then read by Dr. Wesley Bourne of Montreal on "Some Impurities in Ether." This was very much appreciated as the participants in the ensuing discussion indicated.

The customary dinner following the Annual Meeting was held in the Central Hotel when the Scottish Society had the privilege of entertaining the party of visitors. A most enjoyable evening was spent. A novel feature at this dinner was the presence of ladies. By a happy chance the first appearance of lady members of the Scottish Society coincided with the presence of several lady members of the overseas party. The dinner, always a much appreciated item in the Annual Meeting, was especially appreciated this year in the opportunities it gave of social intercourse with our guests. It very fittingly brought to a close a most memorable and stimulating meeting.

The Editor of the British Journal of Anaesthesia apologises for the late appearance of this number. This has been made necessary in order to include an account of the Nottingham Meetings as it was deemed inadvisable to postpone this account until a future issue.

The Editorial Board of the British Journal of Anaesthesia held its annual meeting at Nottingham during the afternoon of July 22nd. A satisfactory report was received. Dr. F. H. McMechan was unanimously elected Honorary Associate Editor in token of the highly valuable work he has done, and continues to do, for Anaesthesia generally.

THE FUTURE OF ANÆSTHESIA.

By SAMUEL JOHNSTON, M.A., M.D., C.M., F.A.C.P.

THE PRESIDENTIAL ADDRESS BY SAMUEL JOHNSTON, M.A., M.D., C. M., F.A.C.P., OF TORONTO, ENTITLED "THE FUTURE OF ANAESTHESIA, OPENED THE MEETING ON THE MORNING OF JULY 21ST. THE PAPER, IN PART, WAS AS FOLLOWS:

In this workaday world we cannot rest content with the achievements of the past or the progress of the present. Although anæsthesia has passed the venerable age of three score years and ten, I cannot challenge your attention more dramatically to its age-old value, than to ask the question: "What would happen to-morrow if anæsthesia were blotted from the world to-day?" The whole structure of modern surgery, a great part of medical practice, and most laboratory research would go crashing into the abyss of oblivion. Can you conceive of life going on without surcease from pain, in face of the fact that day by day, as many casualties of peace drift into our hospitals as were evacuated from the trenches in the war?

Commonplace as anæsthesia has become to us, it remains so vital a concern to the public, that in the United States the only members of the medical and dental professions in the Congressional and New York University Halls of Fame are Crawford W. Long and William T. Morton—those imperishable figures of the first use and public demonstration of etherization for painless surgery.

Nor should we forget that had it not been for other immortals of anæsthesia, its beneficence might have been lost to us, even after its discovery and demonstration. At a time when the utility of anæsthesia in surgery hung in the balance of space, John Snow went into the laboratory and gave the speciality a scientific interpretation and developed satisfactory methods for clinical use. In so doing, he became the founder of that illustrious line of research workers and anæsthetists who have graced the speciality since his day.

Had Sir James Y. Simpson lacked the courage to defeat the entrenched religionists, or had Her Majesty, Queen Victoria, failed him in personally approving Chloroform a la Reine, our women of to-day, under the curse of Eve, might still be bringing forth their children in pain and sorrow.

What of dental anæsthesia, had Wells, Morton, Colton, and Evans been timid and unventuring souls instead of the intrepid pioneers they were? We still believe that painless surgery was welcomed with open arms by many, despite the fact that when Hickman memoralised the French Academy, Velpau and his associates denounced the claims of anæsthesia as a chimera, and only Larry—of later Napoleonic fame—

believed in him. Even in the sixties General Grant had to over-ride the bitterest opposition of his own Army Medical Service in giving Morton a special field ambulance and permission to anæsthetize the wounded Rebels and Yankees in the later campaigns of the Civil War—and 10,000 were thus spared the conscious agony of sitting in at their own operations.

Assembled as we are here to-day, we think of anæsthesia as having permeated the known world, and yet among races and nations of hundreds of millions of souls, painless surgery is as primitive now as it was among the Scythians and Incas, and in China in the days of Hoa-tho! When we consider the future of anæsthesia, what of these numberless hordes?

In our own midst, how many countless things are done in our hospitals, clinics, offices, and the homes of our patients with never a thought of pain relief? This is one of the remaining cruelties of medical practice, and must pass before we are really entitled to the affection and esteem of the public, who look to us to deliver them from unnecessary suffering.

ORGANISATION.

Organisation has been the slogan of progress in all ages, and anæsthesia has had its full quota. The famous old London Society, now the Section on Anæsthetics of The Royal Society of Medicine, this Section on Anæsthetics of the British Medical Association, and the Scottish Society of Anæsthetists, all have their counter-parts in the Associated Anæsthetists of the United States and Canada and its five Regional Societies —The Canadian, Eastern, Mid-Western, Southern, and Pacific Coast.

The most recent advance in organisation in America, is represented by the Anæsthesia Research Society, originally only national, but now international in scope.

So far, during its brief existence, it has organised a Research Committee of the more important scientific and clinical investigators in the speciality; it has established its own journal—"Current Researches in Anæsthesia and Analgesia"—it has issued special monographs and anticipates reviving an Anæsthetic Year Book. At the same time it is finding funds for fostering research.

Beginning with 1926, this Society has sent its Journal to every American and Canadian Medical and Dental School and Society, as well as Teaching Hospital Libraries, with the purpose of making the progress of anæsthesia available in as many places of reference as possible, especially for the generation of Anæsthetists who will follow our own. Its Record Committee has developed a uniform anæsthesia chart, and is working on a student's chart for teaching purposes.

The activities of the Research Society have so intrigued pure

science, that its most noted devotees in the larger Universities and Laboratories find pleasure in attending the various meetings and presenting their latest investigations and results. This has enabled the Society to provide very remarkable sessions of research papers, and has opened many laboratories for experimental demonstrations. This correlation of interests has brought the achievements of science into the operating room, and has sent the clinical problems of anæsthesia back to the laboratory for solution.

Whether further regional organisation would advance the progress of anæsthesia in the British Isles and the status of British Anæsthetists, is something for your discreet consideration. But this recognition of anæsthesia by the British Medical Association leads us to hope for the development of sections or societies in the Colonies, especially Australia, New Zealand, and South Africa, where interest in this connection would seem to have an interesting future.

TEACHING ANÆSTHESIA.

The fact that an older generation of anæsthetists may have lacked something of the laboratory development of present-day medicine, does not prevent us from realising that progress in anæsthesia has always rested on a foundation of clinical practice upon experimental science, and in visioning the future we cannot but feel convinced that the coming generation of anæsthetists must have the resources of applied physics, mechanics, chemistry, bio-chemistry, pharmacology and pathology, as part of the basis of their future careers. Coupled with these, there must also be a well rounded-out medical education in the essentials of general practice, and most particularly in the technical and clinical phases of anæsthesia. Such requirements are none too drastic. In fact, a correlation of basic subjects, in terms of essential knowledge, in relation to future utility, is merely a common sense preparation of the medical student for clinical practice. When possible, it is always preferable to develop information and technique on experimental animals than on human beings —always remembering, however, that the practice of medicine is a humane art, and not a cold-blooded laboratory experiment, as is too often the case in the performance of this work.

Back of this idea of teaching is an ideal of service. Medical education and organised anæsthesia cannot accomplish their larger purposes merely in securing a steady flow of housemen, proficient enough to satisfy the demands of hospital anæsthesia service and ambitious enough to provide a limited source of recruits for maintaining and extending the ranks of the speciality.

If the medical profession is ever to accomplish the broader possibilities of anæsthesia in relation to public service, every

physician must be qualified to give safely and pleasantly such anæsthesia as may be required in painless childbirth or minor surgery, whether in the home, industrial clinic, or office.

In considering the future of the teaching of anæsthesia, one naturally takes a survey of its past history and present advancement, and the short period of time that has elapsed since the introduction of this subject in the curriculum of our teaching hospitals is amazing. When one realises that it is only within the last twenty-five years that internes in our Canadian hospitals were taught anything of the art of anæsthesia, or that students were given more than one lecture in this subject during their entire medical course, the growth in this speciality, as exemplified in the present system of anæsthesia in the Toronto General Hospital, would appear phenomenal. To-day, there exists in this institution, which is affiliated with the University of Toronto, a department in anæsthesia consisting of a chief and eight assistants, all of whom are specialists in the art. The chief is a member of the Medical Advisory Board of the Hospital, which is composed of the heads of the various departments. He is also lecturer in anæsthesia in the Faculty of Medicine of the University of Toronto.

RECORDS AND SAFETY FIRST.

The International Anæsthesia Research Society in developing its uniform Anæsthesia Record—which is really a safety-first campaign to prevent needless fatalities—stands ready to co-operate with surgery in this respect.

For the future the patient's fate is not to be left to chance. Hence the Research Society's Record demands the following essentials:—

1st.—Evaluation of surgical and anæsthetic risk before operation, to determine what pre-operative therapy, preparation and care will add to the prospects for a safer operative ordeal and a more assured recovery.

2nd.—Five-minute blood pressure guides and safeguards during the entire operative period to give accurate information to indicate that the patient is still in a zone of safety or to anticipate the onset of shock and provide remedial measures in time to be effective and life saving.

3rd.—Evaluation of recovery indices after operation, to determine post-operative therapy and care that will reduce morbidity to a negligible minimum.

Simply as these essentials may be stated, they can be made to include all the resources of experimental and clinical progress in medical practice as adaptable to the preparation, protection and recovery of operated patients; and the more intensively and routinely anæsthetists and surgical teams extend the use of these safety-first essentials and chart the treacherous course 'twixt life and death, the more gloriously

will they serve the interests of safer surgery, and the sooner will they secure the utter and complete confidence of suffering humanity. The "supposedly fit" will cease to pass away unexpectedly and without adequate explanation; the "gravest risks" will no longer be hurried into emergency operations without safeguarding preparation, and there will be no guess work about what is happening to the patient during the operative period. Finally, the critical seventy-two hours of post-operative anxiety, morbidity, and too frequent mortality will give way to the blessing of a comfortable and uneventful recovery.

SOURCES OF PROGRESS.

Nothing would seem to be more important to the future of anæsthesia than the co-operation of every one in securing supplies of anæsthetics that may be depended on for absolute and undeviating purity and potency. This holds true for the older anæsthetics such as chloroform, ether, ethyl-chloride and nitrous-oxide, as well as for the newer anæsthetics—acetylene, ethylene, and propylene. Strange as it may seem, in spite of all efforts at fool-proof production, packing and storage, anæsthetics still get into the operating room, that now and again are open to the suspicion of contamination with impure or deteriorating by-products. It augurs well for the ultimate solution of this problem, that a Joint Committee to investigate and act in these premises has been established by the British Medical Council and Section on Anæsthetics of the Royal Society of Medicine. No precautions in commercial handling, hospital testing, and operating room use can be too rigid or exhaustive in obviating the occasional disasters, seemingly due to unaccountable and all but inexplicable impurities in anæsthetics.

ANÆSTHESIA EXCHANGES.

Perhaps without realising the full significance of what has been done, or its possibiltities, anæsthesia has established two central exchanges—one in Manchester, and the other in Avon Lake, Ohio. If any of you have had occasion to get in touch with either of these exchanges to secure information or be connected with someone who could give it to you, you readily appreciate my inference that such exchanges, and those who man them play an important role in the future of anæsthesia. The speciality is fortunate in having the incumbents of these exchanges peculiarly qualified to carry on the editorial organisation and executive duties that are involved.

Regarding the Manchester Exchange, it is splendidly manned by Dr. H. M. Cohen, assisted by Dr. S. R. Wilson, both of whom need no introduction to this Association. They are doing excellent work, and receiving loyal support from their fellow anæsthetists.

"The Little Father of Anæsthesia" in the United States and Canada to-day, Dr. Frank H. McMechan—who is the Avon Lake Exchange—has the heart-whole affection and devotion of each and all of us who know him. To him belongs the credit of the organisation of the existing Societies of Anæsthetists in these two countries, as well as the founding of the International Anæsthesia Research Society. "The centre of every man's existence is a dream," and anæsthesia and its advancement have been his. His inspiration has come from "a clear vision of the eternal landscape of the past"—and to him we owe our meeting here to-day—an achievement truly worthy of a Prometheus!

In extending and cementing the fellowship of anæsthesia, may we not look forward to many joint meetings as well as to the prospect that out of these associations many more may eventuate for the future, and out of them may be developed a College of Anæsthetists, international in scope and purpose. The founding of such a college would go far in raising the speciality of anæsthesia to its proper level, and the qualifications could be made exacting enough for membership, to be a challenge of perfection in work and prestige of character.

THE PATIENT'S VIEWPOINT.

In viewing the future of anæsthesia from the annals of the past, one realises above all else, the momentous changes due to scientific progress—but in this vision we must never for one moment forget that in this world of ours, from the dawn of history to the crack of doom—one thing has remained in the very midst of its own wildest vagaries, strangely immutable—human nature.

For that reason, the patient's point of view remains for the future, as it is in the present and has been in the past, a paramount consideration. Just as the anæsthetists of each generation must be taught their work anew, so too the fathers and mothers, sisters and brothers, of each generation must be re-convinced of the beneficence of the painless practice of medicine. When all is said and done, a successful profession like a successful business, is based on the best possible service to the greatest number of people, and anæsthesia will thrive in direct proportion to its satisfied "customers." Physicians themselves are extremely exigent as patients. Bearing this in mind, we can easily fathom the patient's point of view by putting ourselves in his place and doing by him as we would be done by.

In conclusion, it seems to me that as anæsthetists, our purposes, aspirations, and vision are encompassed in the motto of the Pacific Coast Association: "It is Godlike to relieve pain," and that of the Canadian Society: "We safeguard those who sleep."

Dr. H. M. COHEN, Editor, British Journal of Anæsthesia, next read a paper, entitled, Journals, Current Literature, etc.

We have our colleagues in the United States and Canada to thank for the establishment of the first regular periodical for anaesthetic literature, which is now the well-known Current Researches in Anaesthesia and Analgesia. However, the genesis may well be placed as far back as Dr. Morton's Circular, which that unfortunate world-benefactor commenced to issue in 1847 and continued at irregular intervals at his own expense. This Circular was the medium in which Dr. Morton published the various experiments on etherization, and it marks the various stages of his fight to establish his claims.

At first this Circular appeared almost weekly in the form of a letter of advice, but as its contents increased it was found necessary to enlarge it to four sheets of fine print. Soon the Circular grew into a full sized magazine containing arguments against his opponents, and one issue actually was nearly of one hundred closely printed pages.

The American Journal of Surgery's Quarterly Supplement of Anaesthesia, now abandoned, and which was edited by Dr. F. H. McMechan, for many years held the entire field with the exception of the Bulletin of the National Anaesthesia Research Society.

At the 1922 Meeting of the Canadian Society of Anaesthetists Dr. William Webster, in his Presidential Address, made the suggestion that a Committee be formed, with Dr. McMechan as Chairman, to go into the question of the establishment of a Journal to be devoted entirely to Anaesthesia, and very soon Current Researches replaced the Bulletin as the official publication of the previously mentioned society. In 1923, the British Journal of Anaesthesia made its appearance in England.

How far can a science advance without the "printed word"? One thinks that it will be generally accepted as a truism that there can be no progress unless it is simultaneously possible to record that progress. That is especially true where those who are interested in that particular science or art are scattered over great areas, and who, for that reason, are unable by close contact to benefit by the knowledge or efforts of other workers. In Anaesthesia this is especially so because of the comparatively few practitioners in any given locality. We are, therefore,

dependent on print to convey to us what other men are thinking or doing, and a Journal is of the greatest importance to record the progress of our art here, there and everywhere.

Just as it is a contemporaneous *sine qua non*, much of the development of the future is dependent on its character, for not only do the pages reflect the grade of the advance of Anaesthesia at a given time, but the type of papers and abstracts published represents its teaching value. What is published to-day may contain a seed which the fertile mind of a reader will cause to blossom forth into something of great value. Or it may whet the appetite of some searcher for truth and spur him on to greater activity. Or it may arouse interest in the laggard and convert him into an enthusiast.

A Journal has many advantages over a Society. It has no limitations of scope. In its workings it may be likened to the "endless chain" for it not only reaches and influences its immediate suscribers, but through libraries and exchanges it goes out to the farthest ends of the earth, and anything that is of value is transferred to other periodicals throughout the world. Anything worth while is eagerly abstracted, and no language which has its own print will fail to pass the good things along.

A Journal's usefulness does not end with its power of dissemination. It brings to its readers the ideas and teachings of others. In its abstracts it serves up in more or less digested form the things that are passing through other minds. Every language makes its contribution, and so the output of the whole world of Anaesthesia is recorded number by number for the benefit of all and sundry.

It also has an historical value. One must not forget the men who make up the history of Anaesthesia. Our art, though comparatively young in years, is none the less rich in accomplishments. It is a duty therefore, to bring to public notice the pioneers in Anaesthesia, those to whom we owe its inception and development. Although in a measure, they worked in one limited field of Surgery, notwithstanding that the major art owes much of its success to their efforts, it is left to the Journals of Anaesthesia to review their trials and adventures.

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It is of the greatest importance that the works of such pioneers as John Snow, Clover, Joseph Lister, Paul Bert and Henry Hill Hickman should be brought to the attention of the Medical and Anaesthetic world, and it is, thanks to Dr. Dudley Buxton, that the British Journal of Anaesthesia has been able to perform this valuable function in England.

While it is deemed to be an essential part of the function of a Journal of Anaesthesia to keep fresh the memory and works of pioneers of the past, we must not overlook those pioneers of Modern Anaesthesia who are fortunately still with us. We delight to honour them for their labours, and it is felt that we should spread their story broadcast so that it may be possible for active practitioners, to profit by their experience as well as to be guided by their example.

The Anaesthetic world ought to know something of their struggles in working out techniques of practice, in establishing the relative safety of different drugs, as well as something of the story of what must have been a fight to obtain recognition. The pioneers of Modern Anaesthesia form an important link with the dawn of Anaesthesia, and our Journals are needed to record the important stories which they alone can give the world.

Finally, a periodical to serve its true purpose to Anaesthesia must bear, as its stamp, the badge of courage as well as enterprise, courage to light up the thoughts of men, and enterprise to find proper ways and means. There are still great fields for exploration, and this needs constant emphasizing. Who can prophesy what the future holds for the art of painless surgery? There are many Everests in Anaesthesia yet to be scaled, and there are many paths still to be explored. Our journalism must breathe and exhale the air of adventure, for the future calls for the type of man who will be unafraid to go into the dark places, if need be, to bring about better and safer Anaesthesia.

It is therefore clear that the future of our speciality needs a robust journalism. In "Current Researches," America has now an ideal medium, and, taken with the British Journal of Anaesthesia, Anaesthetists may rest assured that, with their proper support and encouragement, side by side with the advance of Anaesthesia, will be found their own publications.

DR. CHARLES N. MOOTS, TOLEDO, OHIO, READ A PAPER ENTITLED, "EVALUATION OF RISK, BLOOD PRESSURE PROTECTION, AND NITROUS OXIDE-OXYGEN ANAESTHESIA AS VITAL FACTORS IN SAFER GASTRIC SURGERY", THE FOLLOWING BEING AN EXCERPT:

Many years ago, twenty to be exact, long before the general and special laboratories were giving the aid that we find to-day, we were faced by the fact that we had no standardised tests for measuring the risk confronting us. An incomplete urinalysis and hasty examination of the heart and lungs comprised the usual investigations. It was at this time that in America the question of Blood Pressure was attracting attention among our leaders. True, one heard of only one pressure, the systolic. We soon found that this information fell far short of giving us the necessary guidance for formulating a rule. It probably does represent the total labour that is being expended by the arterial system at a given time. It is affected by many factors, including even psychical disturbances—anger and fear, for example.

With the inestimable aid of my anæsthesist, Dr. McKesson, we then commenced a systematic study of the whole question of blood pressure, keeping records of our findings, previous, during, and subsequent to operations. These results finally gave us the necessary information to enable us to formulate an index for operability. In order to express this percentage, we coined the term "Pressure Ratio." This is obtained by dividing the pulse pressure by the diastolic pressure, thus:—

Pulse Pressure / Diastolic Pressure		Pressure Ratio per cent. of Index for operability.
40 P.P. / 80 D.P.	50 p.c.—normal.	20 P.P.— 80 D.P.—25 p.c. Inoperable.

Rule: If the pressure ratio is high or low there is reason to apprehend danger. If it lies between 30 per cent. and 70 per cent. the case is probably operable. If below 25 per cent. or above 75 per cent., probably inoperable.

In applying the rule during the operation it gave us early warning of shock, and enabled us to either apply remediable treatment or bring the operation to a close. As our continued use of this rule has only added to our then acquired confidence, I take the liberty of repeating the conclusions given in 1916:—

(1) The Systolic Pressure alone is of very slight, if any, value.

(2) The Diastolic Pressure alone is of much more value than the systolic alone.
(3) The Pressure Ratio is the essential factor, and offers the earliest danger signal.
(4) There are certain elements in technique which have marked and constant effect upon the pressures. These are as follows:—
(a) The psychical or emotional state of the patient.
(b) The position of the patient upon the table, the extreme Trendelenburg being the worst.
(c) Overdosing by the anæsthetist.
(d) The amount of traumatism inflicted by the actual operation, such as cutting and tearing the tissues with the hands, scissors, or other dull instruments; the packing of large gauze packs instead of rubber tissue into the abdominal cavity.
(e) The preservation of the fluids in the body up to the hour of the operation, this being absolutely necessary to maintain the usual pressure.

During the past year, we have, at the Lucas County Hospital, added another test, known as the Energy Index. This is the sum of the systolic and disastolic pressures multiplied by the pulse rate. The numerals of thousands only are used. Thus:—

Systolic plus Diastolic times pulse Rate — Energy Index.
120 ,, 80 ,, 72 ,, 14,500 mm.

This result would be read as "fourteen." Cases with this index at 12 to 18 would be considered safely operable.

While this test seems to coincide with our own rule, we have used it but a short time, and will require experience with it before making a positive statement as to its utility.

THE AFTERNOON SESSION, JULY 21ST, WAS OPENED WITH A PAPER ON "NEWER ANAESTHETICS: SOME COMPARATIVE CONSIDERATIONS," BY DR. F.H. MCMECHAN, WHICH IS IN PART AS FOLLOWS:

There is some confusion about the comparative potency and toxicity of the various gas anæsthetics, partly because most of them, like nitrous oxide, are eliminated intact, and are therefore looked upon as being equally "inert"; and also on account of the fact that some admit of complete and satisfactory anæsthesia in the presence of percentages of oxygen higher than are contained in air; and even further dilutions of the percentage gas mixture with the more insoluble gases.

However, in studying potency and toxicity in relation to minimal and maximal anæsthesia and lethal dosage, the series of gas anæsthetics may be considered as having somewhat the following gradients, with ethylene as unity: nitrous oxide 0.85; ethylene 1; acetylene 1.5; propylene 2.25; butylene 4.5; and amylene 15.

A further clinical concept of these gradients may be had by a comparison of the usual percentage mixtures of these gases and oxygen for the induction and maintenance of anæsthesia. In a schematic way it may be said that each higher member of the series of gases kills readily at the same percentage mixtures at which the previous one maintains safe anæsthesia.

Normally nitrous oxide has the narrowest margin of anæsthesia and the most limited range of percentage mixtures. Not infrequently in pure gas-oxygen administration a leeway of 1 per cent. in the oxygen percentage may definately determine the control of anæsthesia. Induction may be accomplished either with 100 per cent. nitrous oxide followed by oxygen or by 93 per cent. nitrous oxide and 7 per cent oxygen; or combination of both methods. During maintenance 10 to 15 per cent. oxygen is rarely exceeded, except in the presence of shock, hæmorrhage anæmias, profound sepsis, toxæmia, or cachexia.

Under such conditions the required oxygen percentage may mount to 35, 50, 60, or even higher. Surgical relaxation may be secured by the technique of "secondary saturation" or by the use of synergists. At this point it should be noted that the usual slight duskiness of colour under nitrous oxide-oxygen anæsthesia is no more an indication of cyanosis than the peculiar rosy blush under ethylene-oxygen is an assurance that no anoxæmia is present.

With ethylene it is usually possible to induce anæsthesia with mixtures of 90 to 85 per cent. ethylene and 10 to 15 per cent. oxygen from the beginning. During maintenance the required oxygen percentage may rise to 20 per cent. or more; and better surgical relaxation frequently follows short periods of oxygen up to 40 and 50 per cent. mixtures. Ethylene is thus shown to be slightly cumulative during its administration; although, on account of its low boiling point (—137° F.), it is almost as rapidly eliminated as nitrous oxide. This slightly accumulative effect being due to a higher solubility and some sort of undisclosed and transient physical combination with the lipoids, determines the higher oxygen need, a somewhat wider margin of anæsthesia, and a more intensive obtundent or analgesic effect.

The popularity and widespread use of ethylene has been made possible because ethylene and nitrous oxide are so nearly alike in physical properties that apparatus calibrated for nitrous oxide can be used for ethylene with a margin of error that merely gives a slightly misleading idea of higher percentages than really obtain. Under similar conditions of administration the increased oxygen range with ethylene does not differ very much more than from 3 to 7 per cent. in comparison with nitrous oxide. As with nitrous oxide, the pathological conditions already mentioned demand excessive oxygen percentages. The use of synergists with ethylene for surgical relaxation, especially in abdominal patients who are resistant to nitrous oxide are more susceptible to ethylene and vice versa. Ethylene may readily be used in sequence or combination with nitrous oxide through the same apparatus with proper attachments; many anæsthetists prefer nitrous oxide for the induction

and recovery phases of ethylene anæsthesia (A.D.Luckhardt, W.Easson Brown, T.C.Herb).

Acetylene anæsthesia may be induced in the presence of 20 per cent. oxygen, which may be increased to 30 per cent. in a minute or two. During maintenance the greater solubility and cumulative effect of acetylene usually require an increase of 5 per cent. oxygen and a similar decrease of acetylene in the anæsthetic mixture every five minutes. Thus the closing steps of a long operation may be done under 30 to 40 per cent. acetylene and 70 to 60 per cent. oxygen. Apparatus for acetylene anæsthesia should be especially calibrated for that gas, and the acetone vapour may be eliminated by means of a small filter of activated carbon.

The rapidity with which the oxygen percentage has to be increased during acetylene anæsthesia will depend in great measure on the pathological condition of the patient and the necessity for surgical relaxation. It is being found that, in spite of the apparently greater potency and toxicity of acetylene, it is still sufficiently innocuous that rebreathing during its administration is quite as feasible as with nitrous oxide (H. Wieland, A. and J. D. Goldman).

Propylene is the only other of the newer gas anæsthetics that has been tried out in the operating room. Experimentally it offered some unique possibilities: (a) it was more potent than ethylene or acetylene without being too toxic; (b) it could be used satisfactorily with percentages of oxygen that obviated anoxæmia and maintained the alkaline reserve; and (c) more than this, a third gas (nitrogen) could be used at the same time to render the anæsthetic mixture non-explosive to static and perhaps to other sources of ignition as well.

Dr. E. I. McKesson's paper "Guiding Signs and Dangers" was in part as follows:—

Ethylene-oxygen in about half of the cases produces a slower pulse by about ten beats to the minute than nitrous oxide-oxygen. Sometimes the slowing amounts to a bradycardia. Those cases with a slow pulse seem to do best under its influence. In other cases the pulse rate increases over that of nitrous oxide-oxygen, and these often show a marked fall in blood pressures, resembling shock. In the bradycardia cases the blood pressures may fall somewhat, but not out of proportion unless the blood is being overdosed, which may be quickly determined by a few breaths of oxygen of higher percentage.

The blood pressures under nitrous oxide-oxygen are variable with the depth of anæsthesia, trauma, blood loss, etc., but under normal conditions tend to remain within normal limits. The usual result of ethylene-oxygen is a fall in blood pressure similar to ether after the stage of induction. Time will not permit a full discussion of pulse-blood pressure ratios.

The eye signs, particularly the pupil, are more sluggish and unreliable under ethylene than with nitrous oxide-oxygen. However, deep narcosis usually causes a dilatation of the iris. But when it occurs it is not as promptly remedied by the administration of oxygen as it is after nitrous oxide-oxygen. There is less oscillation of the globes with ethylene.

When high concentrations of ethylene are necessary to secure relaxation, anoxæmia frequently prevents it, and in these cases recourse may be had to nitrous oxide or other procedures, such as premedication or ether. My use of ether for this purpose is rare indeed. In 1925 ether was not used in a single case. This year it has been used in five or six cases for various reasons.

Ethylene, like nitrous oxide, co-ordinates well with morphine-hyoscine premedication. Occasionally atropine is administered during the narcosis for bradycardia, but never as a routine. We use from 1/6 to 1/3 grain of

morphine, usually 1/4 grain in adults, and never more than 1/100 grain of hyoscine.

Cyanosis of some degree is not infrequent in the use of nitrous oxide-oxygen.. This is most marked in the early minutes of narcosis while saturation is in progress. Later in the narcosis, cyanosis is usually absent or of slight degree. Cyanosis is not a sign of anæsthesia, hence it cannot be relied upon. In ethylene-oxygen anæsthesia cyanosis is not as frequently seen, nor is it the pure cyanosis of anoxæmia seen in nitrous oxide anæsthesia, but an *ashy hue* associated with a more precarious state of the patient when it occurs.

Blanching or paleness with ethylene is usually due to nausea. Whether the colour of the blood and skin in ethylene anæsthesia is lighter, due to some action upon the hæmoglobin or to a greater decrease in general metabolism or to some impurity or contamination of the gas such as carbon monoxide, is not yet established. But it may be due to all three or any one of the three in a given case. For myself, I prefer to use ethylene, not as a routine, but on indication for some desired pharmacological action, the same as one would employ morphine, hyoscine, atropine, digitalis, ether, etc., relying upon nitrous oxide-oxygen as the basic anæsthetic.

It appears from the signs that ethylene is more depressing and powerful generally than nitrous oxide.

Dr. E. I. McKesson's paper entitled "Some Physical Factors in the Administration of Gaseous Anæsthetics" was in part as follows:—

There are four outstanding functions for an anæsthetizing apparatus. The first of these comprises suitable inhalers, connexions, valves, etc., for the exclusion of air. The second embodies positive control of the mixture of the gases to be administered. The third is represented in the control of the pressure of mixed gases in the inhaler. The fourth is the regulation of breathing. A fifth might be added as an accessory of great clinical importance—namely, a mechanism for artificial respiration by inflating the lungs with oxygen.

Mixing two gases in proportions sufficiently accurate to maintain narcosis has been a very difficult procedure to carry out over a long period. There are several reasons. First, gases are composed of rapidly moving molecules with a vacuum between them, resulting in a most mobile body. Secondly, owing to this great mobility, and also to the exceedingly rapid absorption of these molecules by the blood, the effect of any change in the proportions of these two kinds of molecules is quickly reflected in the narcosis.

The Intermittent Flow Method.

Twenty years ago it was thought by some anæsthetists that the best way to obtain and maintain the mixture for clinical work was to flow the two gases together continuously and uniformly, varying the proportions usually by adjusting the flow rate of the oxygen. This, however, failed at once, since the nitrous oxide tank valve could not be made to deliver this gas uniformly because of a progressive fall of pressure in the tank as it was used. Likewise the oxygen varied, although in practice it did not freeze. To overcome this difficulty, a few years later a pressure-reducing valve or regulator was interposed between the tank and mixing apparatus proper, so that the falling pressure in the tanks might not so greatly influence the delivery rate.This marked some advance in the evolution of the anæsthetic, but was not completely successful because, however carefully the

regulator had been constructed, it was still subject to relatively large variations of pressure and delivery rate when applied to gases for this purpose. Moreover, the the very small apertures through which the gases were delivered often became more or less obstructed by small particles of water, ice, or foreign matter, or by changes in temperature, and the mixtures varied accordingly between limits quite incompatible with smooth narcosis.

The Intermittent Flow Mehtod.

After considerable clinical experience with various forms of mixing apparatus then available, I experimented along another line. The mechanical problem presented many difficulties, but it appeared that if the nitrous oxide and the oxygen bags could be kept equaly filled or under equal but very low pressure by some automatic bag-filling mechanism, progress might be made. After several trials such valves were perfected which automatically replenished the oxygen and the nitrous oxide bags at each breath—stopping the flow from the tanks into the bags while the patient exhaled and paused between breaths. The bags were thus kept equally filled with their respective gases, regardless of the rate or volume of respirations.

Instead of continuous flow apparatus this became an intermittent flow device. Certain advantages, however, resulted, among which were a foundation for proper mixture control and relief from attempts at manually adjusting the rate of flow, since the respirations regulated this function much better than the anæsthetist had done before. The possible range of automatic gas delivery was enormous—from nothing to more than 33 gallons a minute, so that no patient could exhaust the supply, however rapidly he breathed. The intermittent flow principle also adapted itself to the technique for intermittent administration in producing analgesia for obstetrics.

With the two gases in separate bags but kept at equal pressures the first factor in producing the desired mixture was then satisfied and the construction of a suitable mixing valve mechanism was undertaken.

Professor Finsterer, Vienna, read his paper, "Anæsthesia in Abdominal Operations", the following being an excerpt.

In greater abdominal operations the method of anæsthesia may decide the end result, as injuries from narcosis to the diseased organs lead to death after 3—5 days. To avoid such fatalities the amount of narcotic must be reduced by injection of morphine with atropine, by sparing with ether (experienced anæsthetists), by using nitrous oxide or narcylen instead of ether.

The greatest amount of narcotic can be spared by blocking the nerves leading to the operative field through novocain; therefore in every greater operation (stomach or intestinal resection) an exact local anæsthesia of the abdominal wall and injection of novocain into the mesenteries, should be performed even in cases of general narcosis, resulting in a *combined anæsthesia.*

Different methods of regional (local) anæsthesia may be used in laparotomies. But in every method, a very exact anæsthesia of the anterior abdominal wall is the most important point. The amount and concentration of the agent should be in proportion to the vitality of the patient. As a rule 200—250 cc. of one half per cent of novocain or 1/5 per cent tutocain solution are sufficient; in anæmic or very cachectic patients only a 1/4 per cent novocain solution should be used.

Paravertebral anæsthesia is advantageous only in cases where the injection of one side suffices (cholecystectomy, colon resection).

Splanchnic anæsthesia is a very effective method in stomach resection, gall bladder operations; when carefully performed (no intraspinal nor intravenous injection!) it is nearly harmless. Kappis himself performed over 1,000 anæsthesias without fatality. Braun made 875 splanchnic anæsthesias after his own method, and after the same method Payr 210, Haberer 209, Linhard 181, Kirchmayr 91, and myself 807, all cases without death. To avoid bad by-effect the amount and concentration of novocain should be in proportion to the patient's vitality. In patients with severe anæmia or progressed cachexia only 50 cc. of 1/4 per cent. novocain solution should be used for splanchnic anæsthesia, or if

there is no contra-indication against ether, mesenterial anæsthesia, if necessary combined with a little ether, is preferable because less dangerous.

My own experience with Braun's method is based on : (a) 112 stomach resections for cancer (supported by ether 5 times), (b) 468 resections for gastric or duodenal ulcers (33), (c) 63 radical operations for gastro-jejunal ulcers or gastric ulcers not healed by gastroenterostomy (25), (d) 89 cholecystectomies and choledochotomies (8), (e) 75 of explorative laparotomies, gastroenterostomy etc. (no ether). Ether was used with nervous patients in the beginning of the operation to perform the local and splanchnic anæsthesia, in cases of gastro-jejunal ulcer to separate the adhesions before the splanchnic anæsthesia or at the end of this long lasting operation when splanchnic anæsthesia has gone before finishing the mobilisation.

Meeker's view that splanchnic anæsthesia is only dangerous and not effective, therefore superflous, is contradicted by the experiences in over 2,300 cases of splanchnic anæsthesia after Braun and 1,000 cases performed by Kappis himself.

Parasacral anæsthesia is useful for every operation on the rectum, bladder and uterus, but it must be combined with injection of novocain on the 5th lumbar vertebra to block the lumbar ganglion. Through this method the results of abdomino-sacral resection of the cancer of the rectum can be improved, (my own mortality, formerly 31 per cent, now 10 per cent.)

Spinal anæsthesia is useful only in pelvic operation. I prefer parasacral anæsthesia which is less dangerous. High spinal anæsthesia is too dangerous, especially for operation in the upper abdomen, and should therefore not be used.

The greatest advantage of regional anæsthesia alone or combined with a little ether, is the fact that contra-indications (severe lung and heart diseases, old age, progressed cachexia etc.) need no longer be considered, despite which, the total result can be improved, as fatalities by so called "operative shock," gastric or intestinal atony or lung complications, are almost always prevented. In my own material among 841 stomach resections for ulcer, 185 intestinal resections and

259 cholecystectomies, I have not had a single fatality from "operative shock", atony or pneumonia, despite the fact that 137 patients were from 60-88 years of age.

The *gastric resection for ulcer* which I perform almost in all cases shows a mortality of 5.3 per cent. in 841 cases. In cases with acute hæmorrhage the mortality was high (54 resections with 8 fatalities, 14.8 percent.),especially in late operations (28 resections with 7 fatalities, 25 per cent.). During the war the mortality in the other cases was high (peritonitis), 13.5 per cent. ; since 1919 it has gone back to 2.7 per cent.. There was no fatality from pneumonia among 841 resections, although 87 patients were from 60-78 years old.

In *stomach resections for cancer* the mortality depends on the extent of a resection, being higher in cases in which parts of the invaded organs (liver, pancreas, colon etc.) had to be resected; among 109 such cases 44 fatalities occurred, 41.7 per cent. whereas in 155 resections of the stomach alone, there were 11 fatalities, 7.1 per cent. As in cases of progressed cachexia also, the resection can be successfully performed (in 13 cases the weight of the patient was less than 80 pounds, all cases recovered after resection). In using local anæsthesia the 2 stage resection is no longer necessary.

24 hours after resection of 4 meters of gangrenous strangu-

In *cholecystectomies* and choledochotomies the results are improved as fatalities on the 3-5th day through liver insufficiency and death from pneumonia have not occurred. In 216 cholecystectomies there were 5 fatalities (2 lung embolia, 2 peritonitis, 1 post operative hæmorrhage). In 43 cases of cholecystectomies and choledochotomies for common duct obstruction, there were 4 fatalities in very progressed cases (2 peritonitis, 1 subphrenic abscess after 4 weeks, hæmorrhagic diathesis). Among 20 patients over 60-77 years, only one died, 4 weeks after the operation, from subphrenic abscess.

In the *resection of the small intestine* the results depend firstly upon the duration of the obstruction and the presence of peritonitis. In 56 resections I had 8 fatalities, 5 due to gangrene and peritonitis, 1 due to thrombosis of the vena meseraica and vena portæ, a 76 year old woman died

lated bowel; it is remarkable that of 9 patients between 71 and 87 years, only the woman with the extended gangrene died.

In *colon resection* the insufficiency of the sutures can be prevented as the surgeon has plenty of time to make a very broad lateral anastomosis with 3 layers of sutures, and post-operative atony, which endangers the sutures, is not observed. By this way the colon resection for cancer shows good results with lateral anastomosis, if the bowel is evacuated normally, or through a preliminary colostomy on the transverse colon. Of 19 resections for cancer of the left part of the colon, with lateral anastomosis, 2 patients died (1 case peritonitis, no leakage, the other, heart insufficiency, after 2 weeks). No operative shock, no pneumonia, despite the fact that 11 were over 60 years.

Conclusion.

In major abdominal operations *general narcosis* with ether or chloroform injures the parenchymatous organs on account of its longer duration. This may lead to death through insufficiency of the organ.

These injuries of the organs may be avoided by the use of *combined* anæsthesia; therefore it should be employed in every greater laparotomy in which it is impossible to perform the whole operation under regional anæsthesia. In combined anæsthesia Nitrous-oxide or Narcylen are the least injurious.

Mesenteric anæsthesia is almost harmless and may be resorted to in every case. It is the most effective agent in the combined anæsthesia.

Paravertebral anæsthesia should be used in operations in which the injection on the one side only suffices.

Splanchnic anæsthesia after the method of Braun is almost without danger, and in about 90 per cent of operations on the upper abdomen sufficient.

Parasacral anæsthesia combined with blocking of the lumbar segment is sufficient for radical operation for cancer of the rectum and for all gynecological operations.

By the use of regional anæsthesia the results of great abdominal operations are improved because death from so called operative shock, pneumonia and atony of the bowel can be almost always avoided.

C. LANGTON HEWER, M.B., B.S. LOND., READ A PAPER ENTITLED "ENDOTRACHEAL NITROUS OXIDE-OXYGEN-ETHER ANAESTHESIA IN GASTRIC SURGERY. THE FOLLOWING IS AN EXCERPT:

We come to the method which in my opinion gives the best results of all in gastric surgery; this consists in administering a mixture of nitrous oxide, oxygen, and ether through a tracheal catheter. I have now employed this method as a routine for five years in about 3,500 cases, of which about 1,000 were for upper abdominal operations.

The apparatus required is not extensive. Any sight-feed gas and oxygen machine can be employed, although it is better to have either a pressure guage or mercury manometer connected with the exit tube to give an indication of the endotracheal pressure. If all the connexions are rigid, an adjustable safety-valve is also advisable, but in most types of apparatus the corks will blow out of the bottles long before a dangerous pressure is reached.

The technique is as follows. The patient is given a preliminary atropine injection and is fully anæsthetized by any method which the administrator prefers. When the jaw muscles are completely relaxed a direct-vision laryngoscope is passed along the dorsum of the tongue until the epiglottis is seen. This is gently pushed forwards with the curved end of the laryngoscope, and the glottis will then come into view. The end of a tracheal catheter is then smeared with sterile vaseline and slipped between the vocal cords and pushed onwards for another three or four inches. The laryngoscope is then withdrawn, and the proximal end of the catheter connected up to the exit tube of the gas and oxygen machine. Difficulties in passing the catheter are nearly always due to the patient being insufficiently anæsthetized. In this case it may be almost impossible to see the glottis, and even if this is accomplished the cords will probably be in a state of adductor spasm. If a catheter is then forced between them some post-operative laryngitis will almost certainly ensue. Opinions differ as to the best position for the patient's head. I have found that if it be placed just flat and exactly in the middle line little difficulty is usually experienced in

finding the glottis. Hyperextension of the head, on the other hand, although favoured by laryngologists, stretches the soft parts and should be avoided. When the catheter is in position, a mixture of 50 per cent. nitrous oxyide and 50 per cent. oxygen passing through ether is first employed. This may cause a certain amount of coughing, which soon passes off as the anæsthesia becomes more profound. The amount and proportion of the gases are then regulated until the colour of the mucous membranes is just pink and the manometer shows a pressure of about + 5 mm. Hg on inspiration. In an average case the breathing becomes shallow and regular as in a sleeping patient, but occasionally there is a certain amount of obstruction to the return airway due to a large tongue, in which case an artificial airway should be inserted. Two catheters are, as a rule quite unnecessary in gastric case. By increasing the proportion and pressure of oxygen the respiratory movements can be brought down to practically zero, and, indeed, complete apnoea may occur for a considerable time, the oxygen diffusing through the bronchioles and alveoli sufficiently rapidly to oxygenate the blood. This, of course, is of great assistance to the surgeon when performing anastomoses, as the suture line is perfectly still.

In long gastric operations it is always advisable to take blood pressure and pulse records at least every five minutes. This can easily be done by strapping a stethoscope end over the brachial artery in the antecubital fossa just below the cuff of the sphygmomanometer. Systolic and diastolic pressures should both be taken, and, if possible, recorded as a graph. In my opinion the best indication of the patient's general condition is given by observing the tendency of the pulse pressure and pulse rate. By this means ample time is given for antishock methods to be adopted before severe collapse has occurred.

Post-operative pulmonary complications can be minimized in two ways. First, at the end of the anæsthesia the gas-oxygen-ether mixture should be switched off and a mixture of 90 per cent. oxygen and 10 per cent. carbon dioxide from a separate cylinder substituted. This will cause immediate forced breathing by the stimulation of the respiratory centre

by the carbon dioxide. The ether vapour will consequently be rapidly rushed out of the lungs, the blood will be fully oxygenated by the 90 per cent. oxygen, and the bases of the lungs will be expanded by the hyperpnoea. Patients can be brought round very rapidly by this de-etherizing process, but in gastric cases it is better to discontinue it after about five minutes. The patient will then relapse into a state of light anæsthesia and will remain free from pain for a considerable time. The second way to avoid respiratory complications is to give small doses of atropine repeatedly for three days after operation—gr. 1/200 hypodermically three times a day is a useful average dose. The only possible objection to this treatment is the antispasmodic action of the drug, which might possibly predispose to paresis of the bowel, but I have never seen any trouble follow from this cause.

AN IMPROVED SCHIMMELSBUSCH'S MASK FOR ANÆSTHETICS.

Probably nearly all anæsthetists have used a Schimmelbusch's mask for giving anæsthetics at different times either for open Ether or for Chloroform and it has very many points to recommend it.

It is very handy, packs up in a small compass, and is easily prepared for use and easily cleaned afterwards, but there are some disadvantages which the form now described is intended to obviate.

(i) The frame designed to fix the cover on it is the principal objection. This frame is fitted on a hinge at the handle end of the instrument and clips over the other end by the pressure of a spring, which passes over a small projection on the frame, which forms the face piece of the mask. After continual use the clip is apt to become loose, with the result that the fixing frame becomes loose at any time, and especially at the most inconvenient times, and when the Anæsthetist is especially asked by the Surgeon to " press the anæsthetic " the gauze is often found to have left the mask and to be on the floor.

(ii) If sufficient layers of gauze are used to get a good anæsthesia (24 I believe to be a suitable number) it s often found to be too thick, a layer of gauze in the hinge for the top fixing ring to close down properly for the clip to hold the frame by the fastening is provided, and it is impossible to fix the frame tightly enough to be depended on without its frequently springing open and dropping the gauze.

(iii) The largest size of the mask is made of such a size that the usual width of gauze supplied will not cover the frame completely, so that there are spaces left on each side or at the ends, through which air enters to such an extent that it is impossible to get a really efficient

anæsthesia. The design of the new mask endeavours to eliminate all these defects of the old pattern.

(i) The wire ring, or rather oval, which holds the gauze in position, is a separate piece, not hinged on to the body of the face piece. At the end where the hinged part would be it ends in two sharp pointed ends, which perforate the gauze, and are then passed under a wire bridge which firmly fixes that end of the gauze covering.

(ii) At the other end, where the clip is, there is a ring of spiral spring fixed to the side, which is easily passed over a hook on an upright attached to the oval wire, which keeps the gauze in place, the tension of the spring keeping it firmly pressed down and well fixed so that no ordinary usage can detach the gauze from its proper position.

(iii) The whole mask in its largest size is made of such a size as to take any ordinary width of gauze with no fear of any part not being properly covered. The mask has been made for me by the Medical Supply Association, Limited, Sheffield. It has been used some hundreds of times, and appears to do all that is claimed for it.

ROBERT J. HILLIER,
Anaesthetist, The Jessop Hospital for Women, Sheffield

GROUP OF ANÆSTHETISTS FROM THE UNITED STATES AND CANADA VISITING THIS COUNTRY.

Back Row (left to right):— Dr. Chas. W. Moots, Toledo, Ohio; Mrs. Bourne; Mrs. Moots; Mrs. McKesson; Mrs. H. Wyland; Mrs. J. D. Sidener; Dr. Mary E. Botsford. San Francisco; Dr. J. Wade Elphinstone, Pittsburgh Pa; Mrs. Elphinstone; Dr. Robt. B. Hammond. White Plains, N.Y.; Dr. E. I. McKesson, Toledo, Ohio.
Bottom Row (left to right) :— Mr. Sterling Boos, Plainfield, N.J.; Dr. Lamora Shuey, Toledo, Ohio; Dr. Wesley Bourne, Montreal, Canada; Mrs. McMechan and Dr. T. H. McMechan, Avon Lake, Ohio.